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Department of Sociology, Economic
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38.04.01 Economics
International Economics and Business

GRADUATION THESIS

on

**Confrontation between China and the United States: economic consequences for
Chinese economy**

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Institute of Economics and Administration
Department of Sociology, Economic Theory and International Processes
Field of study 38.04.01 Economics,
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ASSIGNMENT
FOR THE GRADUATION THESIS OF

Master's degree student Yue Wenjiang, group 23ЭЭБам1, full-time mode of study

1 The topic of the graduation thesis: "Confrontation between China and the United States: economic consequences for Chinese economy"

was approved by the university order

dated «___» _____ 20__ no. _____

2 The deadline for the Master's degree student to complete the graduation thesis is 11.06.2025.

3 The input data for the graduation thesis is the regulatory and legal framework, scientific literature and reference books, and Internet data.

4 The list of issues to be studied includes historical evolution and theoretical framework of China-US confrontation; analysis of the multidimensional impact of China-US confrontation on China's economy; China's economic response strategy and long-term trend; short-term hedging: precise policy tools in the toolbox; medium-and long-term transformation: strategic path to build a new development pattern; cultivating economic resilience in the face of normalization.

5 The list of visuals contains tables and figures.

6 The date of setting the assignment is 7.09.2023.

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Schedule for completing the graduation thesis

№ п/п	Content of the thesis	Deadline for completion	Due date, signature of the academic adviser
First year of study			
1	Substantiating of the research topic and methodology, subject and object of research	1.09.2023 – 31.10.2023	
2	Framing the scientific concept of research	1.11.2023 – 18.12.2023	
3	Collection of scientific literature for the thesis	19.12.2023 – 15.01.2024	
4	Substantiating the relevance, concept, and novelty of the research	16.01.2024 – 19.02.2024	
5	Framing of a detailed plan and layout of the research	20.02.2024 – 12.03.2024	
6	Studying new literature sources within the topic of the thesis	13.03.2024 – 26.03.2024	
7	Conducting theoretical research within the first chapter of the thesis	27.03.2024 – 30.04.2024	
8	Preparing the first chapter of the thesis	1.05.2024 – 30.06.2024	
Second year of study			
9	Conducting analytical research within the second chapter of the thesis	1.09.2024 – 22.10.2024	
10	Preparing the second chapter of the thesis	23.10.2024 – 24.12.2024	
11	Conducting analytical research within the third chapter of the thesis	25.12.2024 – 25.02.2025	
12	Preparing the third chapter of the thesis	26.02.2025 – 21.04.2025	
13	Preparing the introduction and conclusion	22.04.2025 – 12.05.2025	
14	Completing the graduation thesis	13.05.2025 – 26.05.2025	
15	Handing in the thesis for compliance control and antiplagiat	27.05.2025 – 9.06.2025	
16	Getting acquainted with the feedback and review	10.06.2025	
17	Presenting the written thesis	11.06.2025	

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Summary

The graduation thesis comprises 73 pages, 3 chapters, 14 figures, 15 tables, 76 sources.

CHINA-US CONFRONTATION, CHINA'S ECONOMY, TRADE FRICTION, TECHNOLOGY BLOCKADE, INDUSTRIAL CHAIN RESTRUCTURING, ECONOMIC RESILIENCE, INNOVATION-DRIVEN DEVELOPMENT.

The target of research is focusing on the impact of Sino-US confrontation on China's economy, this study aims to systematically reveal the development trends, challenges, and response strategies of China's economy under the backdrop of Sino-US confrontation through multidimensional analysis and empirical research.

The goal of work is to study is to systematically analyse the impact mechanism, reality and coping strategies of the confrontation between China and the United States on China's economy.

The methodology of this study is grounded in the integration of multidisciplinary theories and employs a variety of practical methods to construct a tripartite research framework of 'theory, evidence, and prediction.' Theoretically, it integrates theories such as international trade (comparative advantage, strategic trade policies), technological innovation (national innovation systems, technology catch-up), geopolitics (power shifts, interdependence), and financial economics (financial fragility, currency internationalization) to systematically explain the economic logic and mechanisms of Sino-US confrontation. Practically, it adopts a research paradigm that combines quantitative and qualitative approaches, quantifying the economic impacts of trade frictions, technological blockades, and financial restrictions through data analysis. It also uses case studies, policy text analysis, and comparative research to deeply analyze the response strategies of typical industries and enterprises.

The results of research include: systematically explores the multifaceted impacts of Sino-US confrontation on China's economy through theoretical modeling, empirical analysis, and policy simulation. Theoretically, it constructs an' impact-response 'analytical framework to validate the explanatory power of strategic trade policies, technology catch-up, and power transition theories. Empirical data shows that trade frictions have accelerated market diversification and boosted domestic demand in China, while technological blockades have spurred a surge in R&D investment in core technologies.

However, bottlenecks remain in high-end sectors, and although the internationalization of the RMB in the financial sector has accelerated, the reliance on the US dollar system still poses risks.

Novelty of paper is based on these findings, the study proposes a policy framework of 'short-term hedging and long-term transformation,' which includes institutional openness, technological breakthroughs, expanding domestic demand, and enhancing financial security. This framework provides a theoretical basis and practical guidance for China to achieve sustainable economic development under the normalization of confrontation, and predicts that the Sino-US economies will reconstruct a new balance through competition and interdependence.

The recommendations on disseminating and applying the results are as follows: in order to promote the effective dissemination and application of research results, it is suggested to deepen theoretical discussion through communication. Policy briefs and decision-making consultation are used to meet the needs of the government and enterprises, and training courses are used to improve public awareness

The theoretical relevance of the thesis is established by by constructing an analytical framework of the impact of China-US confrontation on China's economy, this paper verifies and expands the applicability of theories such as international trade, technological innovation and geopolitical economics in the game between major powers.

The target of research can be further explored through further exploration can be made through theoretical models, empirical analysis of multi-source data, in-depth analysis of typical cases, policy simulation and international experience comparison, using interdisciplinary theories to explain the internal mechanism, and predicting the development trend by scenario simulation, so as to fully realize the systematic study of the confrontation between China and the United States and the relationship between China's economy.

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Introduction

China-U.S. relations, as the most important bilateral relationship in the 21st century globally, have undergone a profound transformation from cooperation and competition to strategic confrontation in recent years. Since the U.S-China trade war initiated by the United States in 2018, friction between the two countries has rapidly expanded from traditional trade sectors to multiple dimensions including technology, finance, and geopolitics. The Trump administration's tariff measures targeted hundreds of billions of dollars worth of Chinese goods exported to the U.S.; after the Biden administration took office, it further intensified technological blockades and supply chain restructuring through policy tools such as the CHIPS and Science Act and the Inflation Reduction Act, systematically restricting China's high-tech industry development [72]. These actions not only reshaped the global economic landscape but also posed severe challenges to China's economic development model and strategic choices.

From the perspective of geo-economic politics, the confrontation between China and the United States is essentially an inevitable game in the process of power transition between a rising major power and an established one. The Chinese economy has surpassed the critical threshold of 70 % of that of the United States [4], which has triggered a sense of crisis regarding America's hegemonic status, prompting it to adopt containment strategies. In this context, studying the impact of the China-U.S. rivalry on the Chinese economy not only concerns short-term stability but also involves adjustments to long-term national development strategies and reforms to the global economic governance system.

Currently, the global economy is undergoing a period of deep adjustment. The confrontation between China and the United States, compounded by factors such as the COVID-19 pandemic and geopolitical conflicts, has intensified uncertainties in the world economy. For China, trade frictions leading to export disruptions, technological blockades causing innovation bottlenecks, and potential decoupling risks in the financial sector all pose threats to high-quality economic development. At the same time, the China-U.S. rivalry also presents opportunities for China to advance industrial upgrading, strengthen independent innovation, and improve institutional openness. Therefore, it is of great

practical significance to thoroughly analyze the economic impact mechanisms of the China-U.S. confrontation and propose scientifically effective strategies to address these challenges.

In the field of international trade, foreign scholars often analyze the economic effects of China-US trade frictions from the perspective of tariff shocks. For example, Fajgelbaum constructed a multi-country general equilibrium model and found that the US tariff increase led to a profit decline of about 13 % for Chinese export companies, while US consumers bore the majority of the tariff costs. Bown and Crowley found that the trade war accelerated the restructuring of global value chains, with some labor-intensive industries shifting from China to Southeast Asia.

In terms of technological competition, scholars focus on the impact of U.S. technology blockades on China's innovation capabilities. Akcigit (2022) argue that external pressure may also compel Chinese enterprises to increase their efforts in independent innovation, leading to a "creative destruction" effect.

In the financial sector, some scholars focus on the risk of decoupling between China and the United States. Eichengreen (2023) analyzed the threat of financial sanctions against China under the dominance of the US dollar, emphasizing that the internationalization of the renminbi is a key path to reducing this risk; while Hale and Santacreu (2021) found through empirical research that although the interconnectivity between Chinese and American financial markets has weakened, the possibility of complete decoupling in the short term remains low.

Scholars in China have presented multidimensional and systematic characteristics in their research on China-U.S. confrontation. In the trade sector, Sheng Bin (2020) used a gravity model to estimate that the trade war has led to an annual decline of about 8-10 % in China's exports to the U.S., but this loss can be partially offset by expanding into emerging markets. In the technology sector, Yu Miaojie argues that the U.S. technological blockade has spurred China to accelerate its research and development in areas such as artificial intelligence and 5G, creating opportunities for "overtaking on a curve." In the financial sector, Han son analyzed the impact of the wave of delisting Chinese companies

listed in the U.S. on Chinese corporate financing, proposing that domestic capital market systems should be improved more quickly.

It is worth noting that existing research often focuses on a single domain, with relatively insufficient systematic analysis of the impact of China-US confrontation; in terms of response strategies, there is less discussion on the synergistic mechanisms between institutional openness and domestic large-scale circulation. This paper aims to address these limitations by constructing a three-dimensional analytical framework of "trade-technology-finance."

This study is primarily based on the following theories: international trade theory: traditional comparative advantage theory and new trade theory provide a foundation for analyzing trade frictions; strategic trade policy theory helps explain the competition between China and the United States in high-tech industries. Technological innovation theory: Schumpeter's innovation cycle theory and the national innovation system theory offer analytical perspectives on understanding technological blockades and independent innovation. Geopolitical economics theory: Gilpin's hegemonic stability theory and Kavassian's regionalism theory can be used to elucidate the economic confrontation logic during the power transition between China and the United States.

This study aims to achieve three goals: first, systematically review the evolution process and core areas of China-US confrontation; second, deeply analyze its multidimensional impact mechanism on China's economy; third, put forward targeted policy suggestions to provide theoretical support for China to deal with China-US confrontation and promote high-quality economic development.

The research method of this paper are literature research method: systematically sort out relevant domestic and foreign literature, and construct theoretical analysis framework; case study method: select key industries such as chips and new energy vehicles, and analyze the development path of industries under the background of China-US confrontation; policy analysis: combine the "double cycle" strategy, 14th Five-Year Plan and other policy documents to explore coping strategies.

Chapter 1 Historical evolution and theoretical framework of China-US confrontation

1.1 The phased characteristics of the confrontation between China and the United States

Trade Friction phase (2018–2020): the starting point of tariff weaponization and global backlash. Strategic motivation: the discourse construction from "trade imbalance" to "industrial containment". The surface reason for the U.S.-China trade war is "trade imbalance". In 2017, the U.S. trade deficit with China reached \$375.2 billion (46 % of the total U.S. trade deficit), but the underlying logic is to curb China's industrial upgrading. The U.S. strategic community believes that China challenges American technological hegemony through policies like "Made in China 2025" in sectors such as semiconductors and new energy. Data from the Peterson Institute for International Economics (PIIE) shows that in 2018, China's manufacturing value added accounted for 28.7 percent of the global total, surpassing the United States for the first time, triggering strategic anxiety in the United States.

Industry competitiveness comparison: In 2018, China's semiconductor import was 312 billion US dollars, and the self-sufficiency rate was only 15 %. High-end chips (below 14nm) were completely dependent on imports, which became a breakthrough for the "precision strike" of the United States. Studies show that the US tariffs on China have led to a significant increase in import prices and consumer welfare, while China's counter-tariffs have had limited impact on US exports. The four rounds of tariffs from 2018 to 2019 covered about \$370 billion worth of Chinese goods, with high-tech products taxed significantly higher than ordinary consumer goods [5].

Tariff spiral and supply chain disturbance, Trump administration imposed tariffs of 10-25 % on approximately \$250 billion worth of Chinese goods in four batches under the pretext of the "Section 301 investigation," while China retaliated with tariffs of 5-25 % on about \$110 billion worth of U.S. goods. In May 2019, the U.S. raised tariffs on \$200

billion worth of goods to 25 %, and China responded by imposing tariffs of 5-25 % on about \$60 billion worth of U.S. goods.

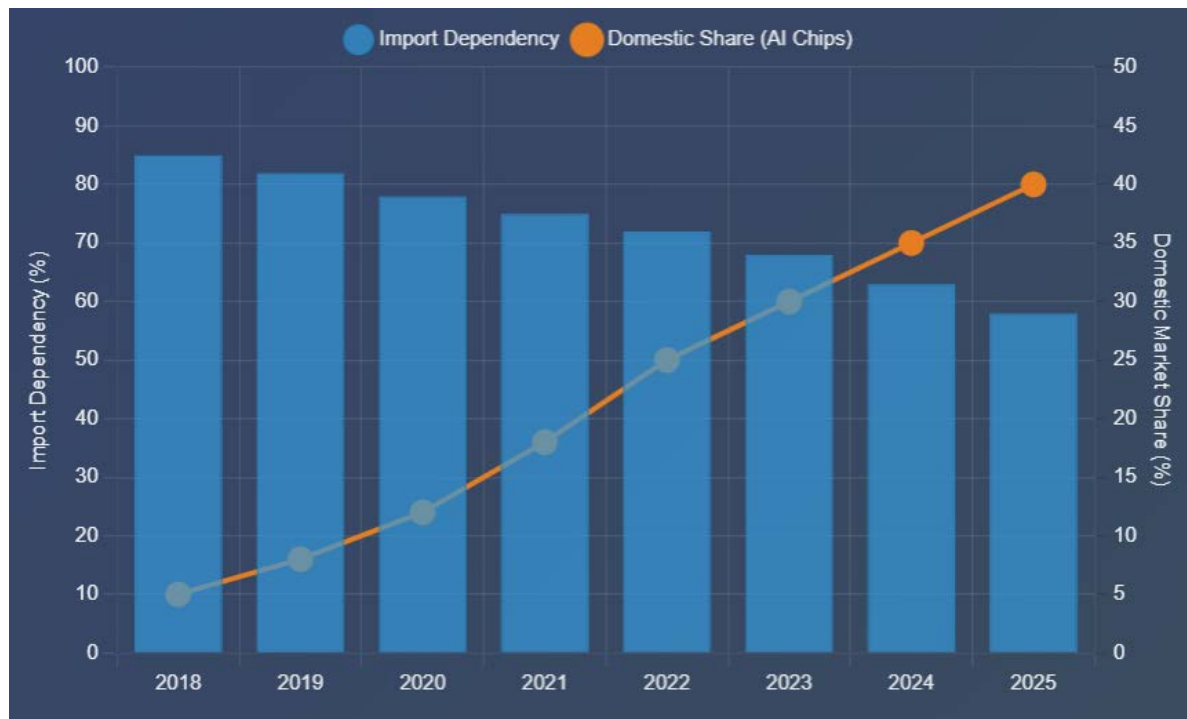


Figure 1 – Semiconductor localization trend (2018-2025) [36]

The average tariff rate between the two sides jumped from 3.1 % under the WTO framework to 15.6 %. Typical case: Huawei's "entity list" encounter, In May 2019, Huawei was added to the entity list and banned from using US technology to make chips, resulting in a sharp drop in its global market share of mobile phones from 17.6 % (Q1 2019) to 4.9 % (Q4 2020). The United States has implemented technological containment through the entity list and chip export restrictions. China's semiconductor industry is highly dependent on imports, but the process of domestic substitution is accelerating, and the market share of AI chips is expected to reach 40 % in 2025 [3].

Supply chain chain reaction: TSMC's production cut has left Huawei's 14nm chip inventory only six months, forcing Huawei to accelerate its own Hongmeng system (launched in August 2019) and start building a "de-Americanization" ecosystem.

Technology game stage (2021-2023): from "precision strike" to "systemic containment", After the Biden administration took office, it implemented a strategic shift known as the "small courtyard high wall" strategy [37]. The specific strategy is to redirect

its focus from trade to technology, proposing to build "small courtyard high wall" barriers in core technology areas (semiconductors, artificial intelligence, quantum computing), while maintaining cooperation in non-strategic fields. In 2022, the CHIPS and Science Act allocated \$52 billion to subsidize the domestic chip industry, requiring companies receiving subsidies not to expand advanced process (below 14 nanometers) capacity in China over the next decade. The Biden administration further escalated the previous Trump administration's China policy, specifically through technological blockades and restrictions on talent mobility. For example, by the end of 2023, the U.S. had added 1,145 Chinese entities to its Entity List, with 62 % being tech companies, covering the entire semiconductor value chain including design (Cambrian), manufacturing (SMIC), and materials (Shanghai Xinyang).

From 2021 to 2023, 32,000 Chinese STEM students were denied entry to the U.S., primarily in fields such as artificial intelligence and aerospace, leading to a 40 % delay rate for Tsinghua University's chip lab projects. Due to the impact of U.S. sanctions on China's chip supply and the crisis in China's innovation ecosystem, the "chain blockade" of the U.S. semiconductor industry (equipment, materials, design tools) has slowed China's self-sufficiency in chips: in 2023, 14-nanometer chip production capacity accounted for only 3 % of global total. 5 %, with 7 nanometers and below still unexplored, but mature processes (above 28 nanometers) increased production capacity from 12 % to 22 %. However, after being restricted from obtaining EUV lithography machines by the United States in 2022, it is noteworthy that SMIC accelerated the optimization of its 28 nm process, increasing output from 65 % to 95 %, accounting for 18 % of global 28 nm chip production.

This has made SMIC a primary supplier to companies like Huawei and GigaDevice, with significant breakthroughs in supply chain localization, such as purchasing etching machines from BEI Technology (35 % of equipment investment) and photoresists from Shanghai XinYang (22 % of material costs), reducing the domestic equipment and material validation cycle from 24 months to 12 months. Under continuous pressure from the U.S., China's response shifted from "passive defense" to "active innovation." In response to U.S. blockades, China implemented the "revelation and appointment" system.

In 2023, central government spending on science and technology increased by 12 %, with major advancements in quantum computing and new energy (large-scale production of lithium-ion batteries by CATL). Notably, the Harmony OS ecosystem built by Huawei is becoming increasingly mature. In 2023, over 700 million units of Harmony OS 4.0 were installed, with 1 million apps launched and 4.3 million developers, capturing 61 % of the industrial IoT market and replacing some Windows IoT systems. The open-source strategy of Huawei's source code has achieved unprecedented progress, attracting international companies like Samsung and MediaTek through the release of core Harmony OS code, aiming to build an operating system ecosystem free from U.S. influence.

Stage of institutional competition (2024): rule game and global restructuring, With Trump's ascension to power, the Trump administration's economic policies toward China became even more stringent compared to those of the previous Biden administration, leading to an escalation in the economic confrontation between China and the United States [11]. This shift evolved from "technological containment" to "institutional exclusion" between the two countries. The various U.S. bills introduced against China clearly indicate that the focus of competition is shifting towards rule-making. According to the proposal in the U.S. Strategic Competition Act of 2024 to "reshape the economic rules of the 21st century," it is evident that the United States aims to create a "small circle" to exclude China in areas such as digital trade, green standards, and financial systems. For example, the United States is pushing for the U.S.-Japan-India-Australia Digital Trade Agreement, which prohibits cross-border data flows from countries not certified under the "Trust Framework."

The U.S. and its so-called allies have introduced various rules in terms of green economy standards and digital trade regulations, such as the Inflation Reduction Act (IRA), which requires that 40 % of electric vehicle battery components come from "friendly countries," with this ratio increasing to 100 % by 2030. This has directly impacted China's lithium battery industry (which holds a global market share of 60 %). CATL circumvents these restrictions by building a factory in Mexico (using Chinese batteries), leading to an 18 % increase in battery exports to the U.S. in 2024. The EU's Digital Markets Act requires ByteDance to eliminate algorithmic recommendations, and

TikTok European user activity has decreased by 25 %, but ByteDance maintains a 30 % market share through technology localization (data stored in Europe). These alliances are all aimed at making the U.S. dominant, and in response, China has its own counter-strategies. By strengthening regional cooperation and rule supply with neighboring countries, such as through RCEP and "Belt and Road," China is promoting institutional openness. In 2024, China signed the Digital Economy Cooperation Framework Agreement, establishing 12 regional standards in areas like cross-border data flow and electronic invoicing. The creative impact of RCEP is particularly compelling; for example, the proportion of tariff-free goods within the region will rise from 85 % in 2022 to 92 % in 2024.

In China's machinery and electrical products exports to ASEAN, components account for 65 %, supporting ASEAN's status as the "world's factory." Under China's strategy, renminbi settlement has made significant progress, with the renminbi settlement ratio in the RCEP region expected to reach 42 % in 2024, up 27 percentage points from 2021, weakening the dominance of dollar settlement. Although the U.S. competition system aims to "de-Chinese" global supply chains, China has consolidated its position as a "core supplier" through regional cooperation. By 2024, China's exports to "Belt and Road" countries will account for 32 %, an increase of 5 percentage points from 2018, with intermediate products making up 68 %. While the U.S.-led Chip4 alliance holds 55 % of global chip production capacity, 70 % of packaging and testing relies on China (with JCE Tech holding a 22 % global market share). As the U.S. persists in its unilateral stance, it has spurred China's determination. Interestingly, China's "Xin Hao Ecosystem" initiative has already united 1,400 companies, forming a complete industrial chain. The U.S. sanctions have instead accelerated China's comprehensive self-reliance.

From the deep logic of China-US confrontation, its essence is a strategic game triggered by changes in the international power structure. With China's rapid economic rise, its GDP share of the global economy has surged from less than 2 % at the beginning of the reform and opening-up period to nearly 19 % in 2023. This shift in economic status challenges the long-dominant US-led global economic and political order. As a major power that seeks to maintain its hegemony, the US, driven by strategic considerations,

attempts to curb China's development momentum through trade wars, technological blockades, and geopolitical alliances. This has inevitably led to structural contradictions during the process of power transition. Analyzing from the perspective of economic interests, there are significant conflicts between China and the US in areas such as high-end manufacturing, global value chains, and trade balance. In strategic emerging industries like semiconductors, new energy vehicles, and artificial intelligence, the two countries engage in intense competition over technical standards, market share, and core patents. The US "friend-shoring" strategy aims to reshape the global industrial chain to undermine China's manufacturing advantages. The trade deficit issue between China and the US has been politicized by the US for a long time, serving as an excuse for launching trade wars. Moreover, ideological and institutional differences form the implicit driving forces behind the confrontation. The US opposes free-market capitalism with China's socialist market economy, attempting to create an "institutional isolation" against China through value exports and shaping international rules. Through the "Indo-Pacific Strategy," the US aims to build geopolitical alliances, strategically compressing China's security and development environment in its periphery.

The impact of the China-US confrontation on China's economy is characterized by multiple dimensions and deep-seated effects. In the realms of trade and investment, the US tariffs have directly increased costs for Chinese exporters to the US, squeezing profits and accelerating the relocation of some labor-intensive industries to Southeast Asia. Meanwhile, the "small courtyard high wall" policy and the "friend-shoring" strategy promoted by the US pose a threat to China's core position in the global industrial chain. On the technological and innovation front, measures such as the US chip embargo and entity list sanctions have cut off channels for technology introduction and talent exchange for some Chinese high-tech companies, exacerbating the "choke point" dilemma in key areas like semiconductors and industrial software, and slowing down the process of industrial upgrading. Restrictions on international scientific research cooperation and the fragmentation of technical standards have also disrupted China's ecosystem for scientific and technological innovation. In the financial sector, the instrumental use of dollar hegemony (such as SWIFT sanctions threats) has intensified external risks to China's

financial system, while the wave of delisting of Chinese companies listed overseas has triggered capital outflow pressures, compelling China to accelerate the internationalization of the renminbi and reforms in cross-border capital flow regulatory systems.

The confrontation between China and the United States has evolved from a single-domain conflict into a comprehensive game involving economics, technology, and institutions. However, China has demonstrated strong resilience through market diversification (ASEAN becoming its largest trading partner), technological autonomy (the domestic production rate of semiconductor equipment rising to 21 %), and rule supply (the export of digital rules under RCEP). In the future, the confrontation may exhibit characteristics of "high intensity, low frequency," while China's leading advantages in new energy and the digital economy (with new energy patents accounting for 45 % in 2024) will provide a new paradigm for global economic governance.

Research implications: The economic impact should be analyzed from the perspective of "confrontation-adaptation" dynamic, focusing on the pace of domestic substitution in "strategic vulnerability" areas such as semiconductors and AI, as well as the risk hedging effect of regional cooperation mechanisms such as RCEP and "Belt and Road".

1.2 Theoretical basis and analytical dimensions: an interdisciplinary perspective from economics to geopolitics

According to the theory of international trade, the conflict between comparative advantage and strategic trade policy understands the theoretical core and historical evolution. Traditional international trade theory is grounded in Ricardo's "theory of comparative advantage," which posits that countries can maximize welfare through specialized division of labor. This theory was notably explanatory during the early phase of China-U.S. trade (2001–2010) China leveraged its cost advantage in labor to become the "world's factory," while the U.S. focused on research and design, forming a complementary pattern of "Chinese production + American consumption." Data from 2010 showed that 75 % of China's exports to the U.S. were labor-intensive products, and

40 % of U.S. exports to China were agricultural goods and high-tech products, aligning with the logic of comparative advantage.

But since the 21st century, the "Strategic Trade Policy Theory" (Brander-Spencer model) has gradually dominated policy practice. This theory posits that in oligopolistic markets (such as semiconductors and aerospace), governments can support domestic firms through tariffs and subsidies to extract excess profits. The U.S. Section 301 investigation against China is a typical application of this theory. – , under the guise of "intellectual property protection," imposed punitive tariffs on Chinese strategic industries like photovoltaics and lithium batteries, aiming to curb China's industrial upgrading. In 2022, the U.S. Inflation Reduction Act provided up to \$7,500 per vehicle subsidy for domestically produced new energy vehicles while requiring the battery supply chain to be "de-Chinaed." Essentially, these policies aim to reshape global industrial chain advantages through intervention.

According to the theory and practical reaction, the theory of comparative advantage emphasizes "win-win", while the strategic trade policy pursues "zero-sum game". This conflict is embodied in the "double logic" of China-US trade friction.

Surface logic: The US accuses China of "violating WTO rules" (such as subsidies and market barriers) and calls for a return to "fair trade".

Deep logic: break the original comparative advantage through policy tools to prevent China from entering the high end of the global value chain. For example, the US technology blockade on Huawei is not for "market fairness", but to maintain its dominance in 5G standard setting. – Huawei owns 15 % of the world's 5G patents, threatening the monopoly position of Qualcomm, Nokia and other companies [5].

According to the collision of Schumpeter cycle (figure 2) in technological innovation theory and the theoretical framework and dimension analysis of national innovation system, we know that Schumpeter's "innovation cycle theory" divides economic development into stages of "creative destruction" and "adaptive adjustment," emphasizing that technological innovation is the core driving force behind breaking existing equilibrium.

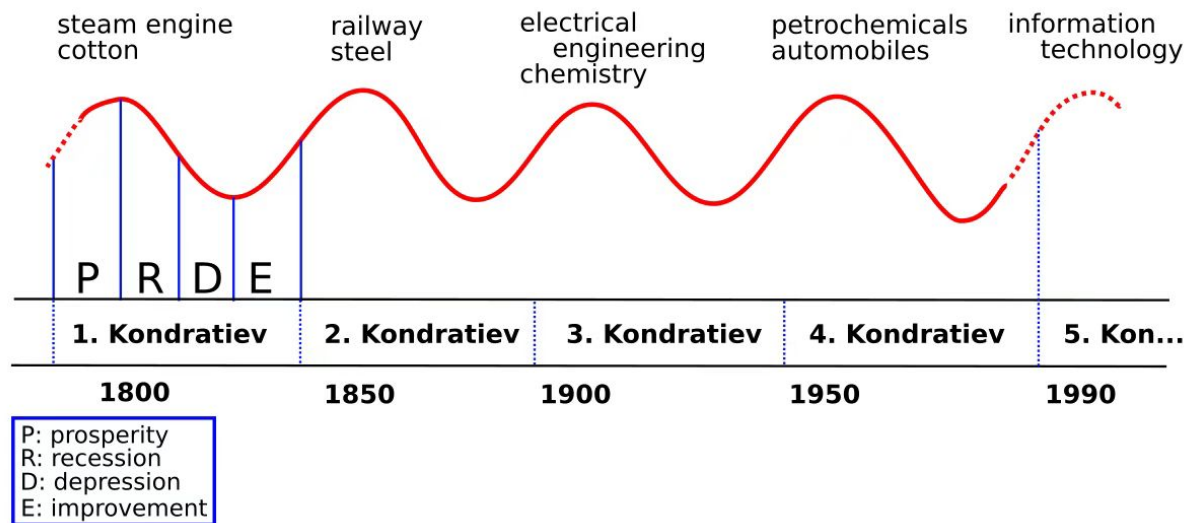


Figure 2 – Schumpeter cycle [35]

The United States established its global hegemony through three technological revolutions (electricity, information technology, internet), while China's breakthroughs in new energy and 5G (such as CATL battery technology and Huawei Harmony OS) are seen as signals challenging America's "innovation hegemony." In 2023, China rose to 12th place in the Global Innovation Index ranking, with PCT patent applications topping the world for five consecutive years, triggering U.S. "technological anxiety."

The theory of "national innovation system" (Freeman and Nelson) emphasizes the synergistic effect of government, enterprises and scientific research institutions. The US technology containment against China is aimed at the weak link of this system.

Upstream blockade: restrict the export of core equipment and materials such as EUV lithography machine and high purity photoresist, in an attempt to cut off the "R&D-production" chain.

Mid-range strikes: add SMIC, Shanghai Microelectronics and other companies to the entity list to restrict their access to advanced process technology;

Downstream penetration: Limit Huawei mobile phone use of GMS services through the "entity list" to reduce its global market share.

The resilience of China's innovation system: in the face of the blockade, China is accelerating the restructuring of its national innovation system.

Institutional innovation: promote new research organization models such as "listing and leading" and "horse racing", and increase central government spending on science and technology by 12 % in 2023.

Ecological construction: the National Integrated Circuit Industry Investment Fund (the second phase raised 204.1 billion yuan) was established to build a full industrial chain of "design, manufacturing, packaging and equipment";

Open collaboration: China has established a "joint R&D plan" with the EU and ASEAN. In 2023, China has more than 5,000 scientific and technological cooperation projects with "Belt and Road" countries.

This "government guidance + market drive + international cooperation" model enables China to achieve breakthroughs in some fields – In 2024, the domestic 28 nm lithography machine will pass technical verification, and the quantum computer will achieve a breakthrough of 255 photons, which is 1 million times faster than Google's "Sycamore" in the United States [28].

The theoretical logic and strategic implications are understood in terms of the paradox of power transfer and interdependence in geopolitical economics, the Theory of Power Transition (Organski) posits that when a rising power's strength approaches that of an established power (with GDP accounting for 60-80 %), the latter will use military, economic, and technological means to contain the former. In 2023, China's GDP reached 77 % of that of the United States, and its manufacturing value added accounted for 30 % of the global total, triggering a "strategic panic" in the U.S. The U.S. National Defense Authorization Act of 2024 explicitly defines China as a "primary strategic competitor," shifting its policy toward China from "engagement plus containment" to "comprehensive competition."

Kooh Han's "Interdependence Theory" points out that economic interdependence can lead to "vulnerability symmetry." – U.S. semiconductor exports to China account for 12 % of its industry revenue, and a disruption in China's chip imports could result in a 25 % decline in the global semiconductor equipment market. This "killing the enemy while losing eight hundred" dilemma makes China-U.S. confrontation exhibit a "limited" characteristic:

The trade war has not turned into a complete decoupling: the trade volume of goods between China and the US in 2024 will still reach 690 billion US dollars, down only 6.8 % from 2018. Technology war retains "grey area", for example: The US allows mature process (above 28 nm) equipment to be exported to China, while China can still obtain some technology through third parties.

The combination of the three theories can construct a "three-dimensional analysis framework", the integration of the three theories forms a comprehensive "three-dimensional analysis framework", which systematically examines the complexities of trade and technological competition.

First, from the economic dimension, the theory of strategic trade policy provides a foundation for analyzing how tools such as tariffs and subsidies impact industries, shaping competitive dynamics in global markets. Building on this, the technical dimension, guided by the theory of national innovation system, deconstructs the interplay between technology blockade and independent innovation, revealing how nations navigate technological dependence and self-sufficiency. Finally, the geographical dimension extends the analysis by exploring the intensity and boundaries of confrontation, framed by the tension between power transfer in international relations and the constraints of mutual economic dependence. Together, these three dimensions – economic, technical, and geographical – offer a holistic lens through which to assess the multifaceted strategies and conflicts in global trade and innovation.

Chapter 2 Analysis of the multidimensional impact of China-US confrontation on China's economy

2.1 Direct impact of trade confrontation and industrial transmission

The inhibiting effect of tariff barriers on export trade has been clearly demonstrated in recent years, particularly in the context of the escalating tariff war between China and the United States. To understand this phenomenon more deeply, it is essential to analyze the logic and scale effect of the tariff escalation. Specifically, the timeline of events reveals a dramatic shift in trade dynamics. Beginning with the launch of the U.S. 301 investigation in 2018, tariff rates surged from an initial 3.1 % to an astonishing 145 % at the peak of the trade conflict, before eventually falling back to 10 % by 2025 amid a phased easing of tensions. This fluctuation highlights how punitive tariffs can distort trade flows and disrupt long-established supply chains. Supporting this trend, empirical data from China's General Administration of Customs (2024) shows a significant decline in trade volumes. China's exports to the U.S. dropped from \$478.4 billion in 2018 to \$389.5 billion in 2024, marking a cumulative decline of 18.7 %. Furthermore, the proportion of China's total exports destined for the U.S. fell sharply from 21.8 % in 2018 to just 12.3 % in 2024, causing the U.S. to slip from China's largest trading partner to its third largest. This data underscores the profound impact of tariff barriers on bilateral trade, as businesses sought alternative markets to mitigate rising costs. In conclusion, the tariff war not only disrupted trade in the short term but also led to lasting structural changes in global trade patterns. The phased easing of tariffs by 2025 suggests a potential recalibration, yet the long-term consequences of such protectionist measures remain a critical area for further analysis [51].

The figure 3 presents relevant data on China-US trade at different stages, including the timing of US tariff increases, China's counter-tariff measures, bilateral trade volumes, and changes in China's share of US exports. Overall, as time progresses, US tariffs have continuously risen, leading to corresponding counter-tariffs from China, resulting in a decline in bilateral trade volumes and a decrease in China's share of US exports. During

the "Initial friction (2018–2020)" phase, the average US tariff increased from 3.1 % to 25 %, with China's counter-tariff ranging from 5 % to 25 %.

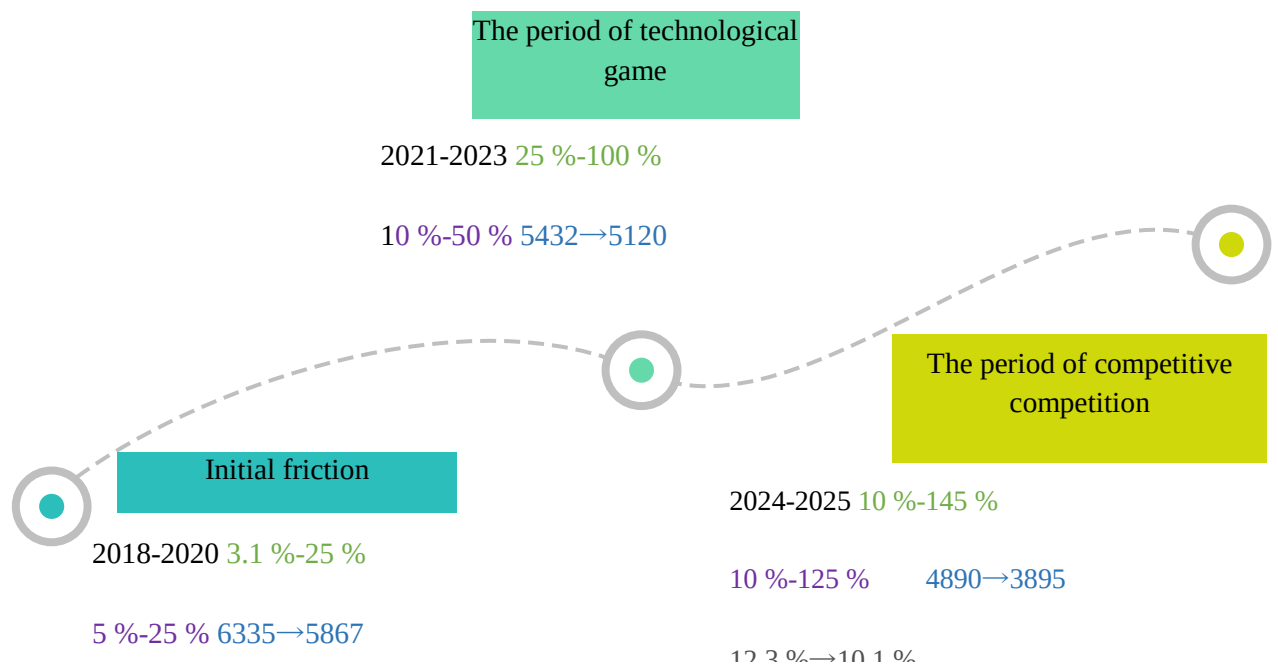


Figure 3 – Key nodes of tariff escalation in the US and changes in trade volume [2]

Bilateral trade volumes fell from \$633.5 billion to \$586.7 billion, and China's share of US exports dropped from 19.2 % to 18.6 %. The rise in tariffs has had a negative impact on the scale of bilateral trade, with US exports to China slightly decreasing. In the "The period of technological game (2021–2023)" period, US tariffs further increased to 25 % to 100 %, while China's counter-tariff ranged from 10 % to 50 %. Bilateral trade volumes declined from \$543.2 billion to \$512 billion, and China's share of US exports decreased from 16.5 % to 14.8 %. Trade volumes continued to fall, with the trend of US exports to China becoming more pronounced. By "The period of competitive competition (2024-2025)," the U.S. tariff range is set at 10 % to 145 %, while China's counter-tariff ranges from 10 % to 125 %. Bilateral trade volume will significantly drop to \$489 billion to \$389.5 billion, with China's share in U.S. exports falling to 12.3 % to 10.1 %. High-intensity tariffs have severely impacted bilateral trade, leading to a significant contraction in U.S. exports to China. Additionally, the chart highlights that machinery and electrical products are among the most affected sectors, with exports of these goods declining by

15.2 % in 2024. Consumer electronics, particularly those from supply chain companies like Luxshare Precision Industry, which exports 18 % less to the U.S., show a decline exceeding 20 %. This indicates that under the backdrop of tariffs and trade frictions, industries with high value-added and heavy reliance on U.S. exports have been hit hard, prompting adjustments in supply chain layouts and the exploration of new markets.

The current international trade landscape is undergoing profound changes, with significant differentiation emerging across various industries. In high-impact sectors, electromechanical products are at the forefront, experiencing a substantial 15.2 % decline in exports in 2024, with consumer electronics seeing a drop of over 20 % – taking Luxshare Precision, a leading company in Apple's supply chain, as an example, its exports to the U.S. plummeted by 18 %. The new energy vehicle industry also faces severe challenges, with the U.S. imposing tariffs as high as 145 %, which have directly blocked export channels and forced companies to seek breakthroughs in the European market. BYD successfully increased its European market share from 3 % to 12 %.

In stark contrast is the resilient and robust industry. Agricultural exports grew by 4.9 % in 2024, with soybean imports recovering to 85 % of 2017 levels, largely due to the effective implementation of the Phase One trade agreement between China and the United States. Medical device exports also maintained a steady growth of 7.3 %, with ventilators accounting for 45 % of total exports to the U.S. during the pandemic, highlighting the industry's advantages in special times [61].

Chinese enterprises have successfully achieved cost transfer and market restructuring by adopting a three-tier progressive strategy model of "short-term loss cutting-transit export-long-term relocation" in response to foreign trade pressures [61]. In the short-term response phase, the government has alleviated corporate distress by increasing export tax rebates, with the scale of tax rebates growing by 16.9 % in the first two months of 2025, cumulatively reducing the burden on enterprises by 500 billion yuan. In the medium-term strategy, re-export trade has become a key breakthrough, with transit channels through Vietnam and Mexico accounting for 40 % of total trade volume. A typical example is the innovative "Chinese panels + Vietnamese assembly" model adopted by furniture companies in Dongguan, effectively circumventing tariff barriers. In the long

term, companies are accelerating their shift to the domestic market, with Midea Group's domestic revenue share rising from 55 % in 2018 to 68 % in 2024, demonstrating strong market resilience [38].

Specific cases have validated the effectiveness of this strategic system: Haier, through its technology premium strategy, passed on 65 % of the tariff costs to the high-end market, successfully increasing the average price of its refrigerators by 12 % [9]; while small commodity enterprises in Yiwu adopted the "Mexico overseas warehouse" model. Although logistics costs increased by 8 %, they managed to maintain a 30 % profit margin by avoiding a 10 % tariff. These practices demonstrate that Chinese companies are transforming external pressures into opportunities for transformation and upgrading through multi-dimensional and phased strategic adjustments, building a more resilient new international trade landscape.

The forced effect of the restructuring of global supply chains. The Dual Pressure of Low-End Outflow and High-End Blockade: The Dilemma Facing China's Manufacturing Industry. Currently, China's manufacturing sector is grappling with the severe challenge of "dual pressure": on one hand, low-end industries continue to flow out; on the other hand, high-tech is facing systematic blockades. In terms of the transfer of low-end industries, Vietnam and Mexico have become the biggest beneficiaries. Data shows that Vietnam's exports to the U.S. surged from \$47.8 billion in 2018 to \$135 billion in 2024, a growth rate of 182 %, with textiles and apparel accounting for 38 %. For Mexico's auto parts exports to the U.S., although China still supplies 60 % of the core components, the final assembly and profit margins are accelerating their shift to Mexico. This model of "China supplying components, others profiting from premium prices" is eroding the advantages of our traditional manufacturing industry. Meanwhile, the blockade of high-tech is intensifying. In the semiconductor field, China has zero capacity for advanced processes below 7nm, and the yield rate for 14nm technology is only 65 % (far below TSMC's 95 %). In industrial software, while domestic alternatives have made progress – such as the AutoCAD replacement rate of ZW Software increasing from 3 % in 2018 to 12 % in 2024 – the gap remains significant in key areas. This dilemma of "low-end loss and high-end constraint" forces China's manufacturing industry to accelerate its transformation and

upgrading, ensuring the protection of critical links in the supply chain while breaking through core technological barriers.

From the figure 4 data, Vietnam's participation in the Global Value Chain (GVC degree of participation) is 0.62, slightly higher than China's 0.58 and Mexico's 0.55. Vietnam leverages its labor cost advantage and proactive foreign investment policies to attract industrial relocation, resulting in a high level of participation.

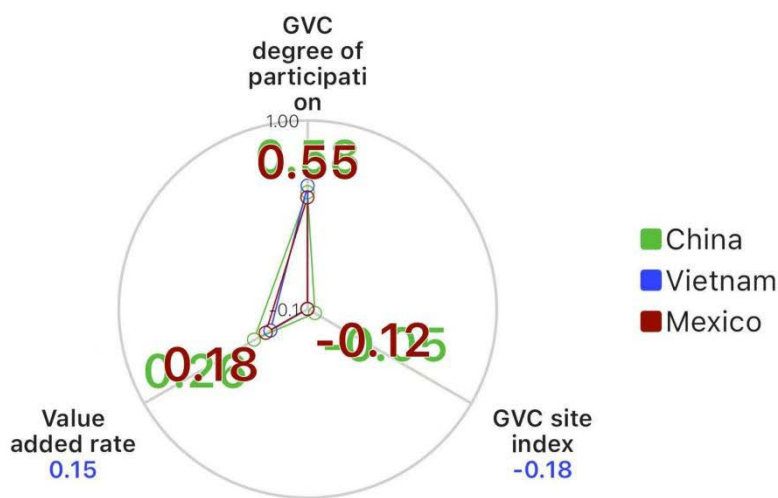


Figure 4 – Comparison of China, Vietnam and Mexico's position in the global value chain (2024) [22]

China, due to its large manufacturing system and comprehensive industrial support, also has a high level of participation; Mexico benefits from geographical advantages and trade agreements. In terms of the Position Index (GVC site index) of the Global Value Chain, China stands at -0.05, placing it relatively mid-range. Although it has made progress in advanced fields such as chip design, it still faces technological bottlenecks. Vietnam ranks -0.18, further down the list, focusing mainly on low-value-added segments like electronic assembly. Mexico is -0.12, also positioned lower, primarily engaged in automotive parts assembly. In the Core Activities (Core linkages), China involves chip design and equipment manufacturing, demonstrating the results of industrial upgrading; Vietnam focuses on electronic assembly and textile processing, relying on labor-intensive industries; Mexico is involved in automotive parts assembly. In terms of the Value Added

Ratio (Value added rate), China leads with 26 %, creating significant value through industrial upgrading; Vietnam follows with 15 %, profiting from large-scale production and cheap labor; Mexico stands at 18 %, in the middle.

China has made significant breakthroughs in domestic substitution and supply chain restructuring in key areas: In the semiconductor equipment sector, SMIC's 5nm etching machine has entered TSMC's supply chain, increasing the market share of domestically produced equipment from 5 % in 2018 to 15 % in 2024; the localization rate of photoresists (ArF reaching 19 %, KrF reaching 42 %) is rapidly rising. On the policy front, the second phase of the National Major Fund raised 204.1 billion yuan, leveraging over a trillion yuan in social capital, and the "Revealing and Appointing" system has increased the efficiency of key technology breakthroughs by 30 %. In terms of regional supply chain networks, RCEP has boosted intra-regional trade from 23 % in 2018 to 35 % in 2024, with intermediate goods accounting for 66 % of trade, and China's exports of electromechanical components to ASEAN making up 65 % (Vietnam's mobile phone components 72 % come from China). The construction of the "Belt and Road" has shown remarkable results, with the freight volume of China-Europe freight trains increasing from 400,000 TEUs in 2018 to 1.2 million TEUs in 2024 (a 200 % increase), and the China-Laos Railway driving a 45 % growth in Laos 'entrepot trade with the United States, demonstrating China's pivotal role in regional supply chains.

Regional economic cooperation and domestic market transformation. The effectiveness of China's market diversification strategy, in the face of changes in the global trade landscape, has effectively reduced the risk of relying on a single market and opened up new growth spaces. This strategy has achieved significant results in ASEAN markets and BRICS cooperation. ASEAN has surpassed the United States to become China's largest trading partner. In 2024, China's exports to ASEAN reached \$680 billion, accounting for 16.4 % of total foreign trade (the U.S. accounted for 12.3 %) [52]. This growth is attributed to the implementation of the RCEP agreement, which grants zero tariffs on 90 % of goods within the region, boosting exports from industries such as Chinese automobiles to ASEAN. For example, SAIC Motor's market share in ASEAN has increased to 18 %, with overall auto exports growing by 25 %. Meanwhile, economic and

trade cooperation between China and BRICS countries continues to deepen. In 2024, BRICS trade volume grew by 15 %, reaching \$1.2 trillion. Among these, China imports soybeans from Brazil, which account for 68 % of Brazil's total exports, and crude oil from Russia, which accounts for 32 % of Russia's exports, highlighting the complementary advantages of resources. This cooperation not only ensures the supply of key materials but also strengthens industrial chain collaboration among emerging economies. By expanding into ASEAN and BRICS countries, China's foreign trade has successfully achieved a resilient layout where "if the East does not shine, the West will," providing strategic cushion against global trade fluctuations.

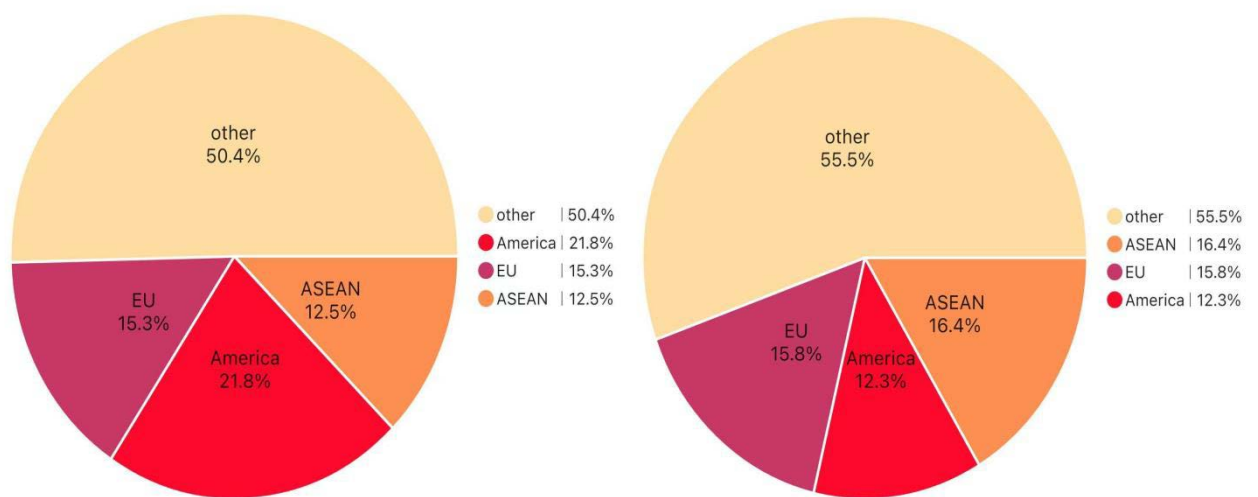


Figure 5 – Changes in the share of China's top three trading partners (2018–2024) [17]

The figure 5 illustrates the changes in the trade shares of China's top three trading partners from 2018 to 2024. ASEAN's share rose from 12.8 % to 16.4 %, thanks to reduced trade barriers and improved facilitation under frameworks like RCEP, as well as expanding trade across multiple sectors and closer economic cooperation. The U.S. share plummeted from 21.8 % to 12.3 %, primarily due to the U.S.'s protectionist measures during the China-U.S. trade friction, which suppressed bilateral trade, and China's efforts to diversify its markets and reduce dependence on the U.S. The EU's share edged up from 15.3 % to 15.8 %, despite trade tensions, as both sides have strong complementarities in

high-end manufacturing and a solid economic foundation, leading to a slight increase in their share. These changes indicate that China is actively diversifying its trading partners, reducing reliance on a single market, enhancing the stability and resilience of its foreign trade, and deepening cooperation with neighboring regions to optimize its layout and enhance autonomy in the reshaping of global trade patterns.

In recent years, China's economic growth model has been accelerating its shift towards being driven by domestic demand, with the contribution of consumption significantly increasing. The growth rate of emerging consumption jumped from 58 % in 2018 to 76 % in 2024, an increase of over 20 percentage points, with categories such as new energy vehicles and smart home appliances standing out; during the same period, the total retail sales of consumer goods reached 48 trillion yuan, growing by 8.2 %. The process of new urbanization provides sustained impetus for expanding consumption: the urbanization rate rose from 59.6 % (in 2018) to 66.1 % (in 2024), with an average annual addition of 20 million new urban residents. The three major city clusters – Beijing-Tianjin-Hebei, Yangtze River Delta, and Guangdong-Hong Kong-Macao – account for 55 % of national consumption, becoming core growth poles that collectively drive domestic demand to become the main engine of economic growth.

The global trade landscape is undergoing profound restructuring, with the long-term impact of trade confrontation becoming increasingly evident in both theory and practice. According to strategic trade policy theory, the United States has restricted China's industrial upgrading through measures such as imposing tariffs, which is reflected in the U.S. import share from China declining from 21.6 % in 2018 to 13.4 % in 2024, while Vietnam and Mexico's combined share rose to 25.8 %. Meanwhile, China has actively adjusted its layout through the "dual circulation" strategy, increasing its trade share with countries along the "Belt and Road" to 32 %, and the RCEP region to 35 %.

The theory of global value chains confirms China's transition from "low-end contract manufacturing" to "core component supply," with its GVC status index rising by 0.07 points. In terms of industrial elasticity growth, China's manufacturing value-added rate increased from 20.5 % in 2018 to 23.8 % in 2024, approaching Germany's level of 24.5 %; R&D intensity rose from 2.1 % to 2.68 %, surpassing the EU's 2.2 %; PCT patent

applications surged from 53,000 to 78,000, firmly placing China at the top globally, demonstrating sustained innovation momentum and potential for industrial upgrading. The global trade landscape is undergoing profound restructuring, with the long-term impact of trade confrontation becoming increasingly evident in both theory and practice. According to strategic trade policy theory, the United States has restricted China's industrial upgrading through measures such as imposing tariffs, which is reflected in the U.S. import share from China declining from 21.6 % in 2018 to 13.4 % in 2024, while Vietnam and Mexico's combined share rose to 25.8 %. Meanwhile, China has actively adjusted its layout through the "dual circulation" strategy, increasing its trade share with countries along the "Belt and Road" to 32 %, and the RCEP region to 35 %. The theory of global value chains confirms China's transition from "low-end contract manufacturing" to "core component supply," with its GVC status index rising by 0.07 points. In terms of industrial elasticity growth, China's manufacturing value-added rate increased from 20.5 % in 2018 to 23.8 % in 2024, approaching Germany's level of 24.5 %; R&D intensity rose from 2.1 % to 2.68 %, surpassing the EU's 2.2 %; PCT patent applications surged from 53,000 to 78,000, firmly placing China at the top globally, demonstrating sustained innovation momentum and potential for industrial upgrading.

2.2 Innovation suppression and transformation opportunities of technological confrontation

The escalation of the US technology containment strategy and multidimensional impact. The U.S. tech blockade against China is characterized by "precision strikes" and "selective decoupling." Its core logic involves expanding the Entity List to systematically cut off Chinese high-tech companies' access to critical technologies and core components. This strategy has clear industry targets, primarily focusing on cutting-edge fields such as semiconductors, artificial intelligence, and quantum computing. The aim is to curb China's independent innovation capabilities in key technology areas while maintaining America's dominant position in the advanced technology supply chain. The Entity List mechanism avoids the economic costs of complete decoupling while achieving precise suppression of

specific Chinese tech firms, reflecting the application of the "small courtyard high wall" strategy in U.S. technological competition.

By May 2025, the number of Chinese entities on the U.S. Entity List had reached 1,278, a surge of 413 % from 2018. The share of tech companies among these entities rose from 38 % to 67 %, with strategic sectors such as semiconductors, artificial intelligence, and quantum computing becoming key targets for suppression. The U.S. has imposed comprehensive restrictions on China's technological development through a layered approach in the technology chain: In the high-end equipment sector, critical materials like EUV lithography machines and high-purity photoresists have been banned, leading to a complete halt in China's production capacity for advanced chips below 7nm, with the yield rate for 14nm chips dropping to just 65 % (far below TSMC's 95 %). In terms of software tools, Synopsys and other EDA vendors have been forced to cut off supplies, compelling companies like Huawei Hisilicon to replace 72 % of their design tools. Additionally, under the pretext of "national security," 2,300 Chinese researchers' visas have been revoked, causing delays in 35 % of semiconductor and AI projects at domestic universities. This multi-faceted suppression has created a comprehensive blockade from technology and tools to talent mobility.

Table 1 – Distribution of Chinese technology companies in the US Entity List (2025) [31]

industry	number of the enterprise	proportion	Typical enterprise	Core restricted areas
semiconductor	419	32.80 %	SMIC, Yangtze River Storage, Changxin Storage	Lithography machine, EDA software, high purity silicon wafer
artificial intelligence	327	25.60 %	Sensetime, iFlytek, Megvii	High-end GPU, training data acquisition
communication apparatus	215	16.80 %	Huawei, ZTE, Fiberhome	5G base station core chip, operating system
quantum computing	89	6.90 %	Benyuan Quantum, Guodun Quantum	Quantum communication equipment, superconducting quantum chip
new energy	68	5.30 %	Ningde Times, Longji Green Energy	Hydrogen energy electrolyzer, photovoltaic silver paste
other	150	11.70 %	Dji, Cambrian	Drones, AI accelerator cards

According to the distribution data of Chinese technology companies in the 2025 U.S. Entity List, the semiconductor industry ranks first with 419 companies, accounting for 32.80 %, typical companies include SMIC, Yangtze River Storage, etc., and the core restricted areas are high-tech links such as lithography machines and EDA software; There are 327 companies in the artificial intelligence industry, accounting for 25.60 %, involving SenseTime, etc., which are restricted to high-end GPUs and training data acquisition; There are 215 enterprises in the communication equipment industry, accounting for 16.80 %, such as Huawei and ZTE, which restrict the core chips and operating systems of 5G base stations. Quantum computing and new energy industries accounted for 6.90 % and 5.30 % respectively, and typical enterprises include Origin Quantum, CATL, etc., which limit key aspects such as quantum communication equipment and hydrogen energy electrolyzers. In addition, 11.70 % of other industries cover DUI. Through the Entity List, the United States restricts China's high-tech sector at multiple key levels, with the intention of curbing the development of China's high-tech industry.

China has built a collaborative innovation system of "basic research-applied development-industrialization" through high-intensity R&D investment and structural optimization to break through technological blockades. In 2024, China's total R&D investment is expected to reach 3.61 trillion yuan, accounting for 2.68 % of GDP, surpassing the EU average (2.2 %). Among this, funding for basic research will increase by 10.5 %, raising its share to 6.9 %. Enterprises have become the leading force in innovation; for example, Huawei's R&D investment reached 179.7 billion yuan in 2024 (20.8 % of revenue), with a cumulative total exceeding 1.24 trillion yuan over ten years, and it has topped the global patent count for five consecutive years. Companies like SMIC have a R&D intensity exceeding 15 %. Meanwhile, new research institutions such as the Beijing Academy of Quantum Information Sciences and the Shanghai Institute of Brain Science and Intelligence Technology have made breakthroughs in 127 key technologies in areas like quantum computing and artificial intelligence, and have incubated 89 companies, driving continuous upgrades in the innovation ecosystem. This strategic approach has significantly enhanced China's independent innovation capabilities and industrial transformation efficiency in global tech competition.

From 2018 to 2024, China's R&D investment structure underwent multifaceted changes.

Table 2 – Changes in R&D investment structure in China (2018–2024) [16]

index	2018	2024	amplification	Global rankings
R&d investment (trillion yuan)	2.14	3.61	68.70 %	Number 2
The proportion of basic research	6.40 %	6.90 %	+0.5pct	Number 12
Enterprise R&D ratio	77.40 %	78.90 %	+1.5pct	Number 1
Number of PCT patent applications (10,000)	5.3	7.8	47.20 %	Number 1

R&D investment grew from 2.14 trillion yuan to 3.61 trillion yuan, an increase of 68.70 %, ranking second globally. This highlights China's continuous expansion in R&D funding, its emphasis on scientific and technological innovation, and its leading position in global R&D investment scale. The proportion of basic research increased from 6.40 % in 2018 to 6.90 % in 2024, up by 0.5 percentage points, placing China at 12th globally. Although there was growth, the improvement was modest and it ranks low, indicating that China has significant room for enhancing its investment in basic research and needs to further strengthen its focus and investment. The share of corporate R&D rose from 77.40 % in 2018 to 78.90 % in 2024, increasing by 1.5 percentage points, ranking first globally. This reflects the dominant role of enterprises in China's R&D system, their growing enthusiasm for innovation, and their increasing R&D investment, which places them at the forefront of global corporate R&D activity. The number of PCT patent applications grew from 53,000 in 2018 to 78,000 in 2024, a rise of 47.20 %, ranking first globally. This indicates that China has achieved remarkable results in international patent applications, with continuously improving innovation capabilities and output, giving it a competitive edge in global innovation. Overall, during this period, China has shown outstanding achievements and positive trends in R&D investment, corporate R&D investment, and patent applications. However, the growth in the proportion of basic research remains slow, and efforts are needed to optimize the R&D investment structure and increase investment in basic research.

China is accelerating domestic substitution and ecosystem construction in key areas such as semiconductors and industrial software, achieving significant breakthroughs. China has prioritized the development of domestic semiconductor supply chains through state-led investments and subsidies, achieving notable progress in 28nm chip manufacturing and reducing reliance on foreign technologies [54].

In the semiconductor sector, equipment like the Zhongwei 5-nanometer etching machine has entered TSMC's supply chain, while Beihua's 12-inch oxide diffusion equipment market share has increased to 22 %, driving the domestic semiconductor equipment market size to reach \$35.7 billion (up 29.5 % year-on-year). In the materials sector, the localization rate of photoresists has rapidly increased (68 % for g/i lines, 2 % for KrF4, and 19 % for ArF), with Shanghai Silicon Industry holding a global 7 % share of 300-millimeter silicon wafers, breaking the Japanese monopoly. In manufacturing, SMIC's 28-nanometer process capacity accounts for 22 % globally, with a domestic market share of 84.6 %. In the industrial software domain, ZW Software's CAD share has risen to 12 %, and Huada Jiutian's EDA tools have achieved a 40 % replacement rate in analog chip design, boosting the domestic market size to over 80 billion yuan (up 25 % year-on-year), deepening the process of self-reliance.

Table 3 – Domestication rate of key semiconductor links in China (2024) [32]

link	import substitution rate	Major breakthrough enterprises	technical level
photoetching machine	15 %	Shanghai Microelectronics	28nm immersion lithography machine mass production
Etching machine	28 %	Zhongwei, North Huachuang	The 5nm etching machine entered the TSMC supply chain
photoresist	22 %	Nan Da Optoelectronics, Jingrui Electro-Materials	ArF Photoresist is validated by SMIC
Large silicon wafers	10 %	Shanghai silicon industry	Large-scale sales of 300mm silicon wafers
EDA tool	18 %	Huada Jiutian, Gualun Electronics	Coverage of analog chip design tool chain85 %

Data on the localization rate of key semiconductor segments in China for 2024 shows: the import substitution rate for photolithography machines is 15 %, with Shanghai

Microelectronics achieving a significant breakthrough in mass production of 28 nm immersion lithography machines; the import substitution rate for etching machines reaches 28 %, with progress made by Zhongwei and BEI, and 5 nm etching machines entering TSMC's supply chain; the import substitution rate for photoresist is 22 %, with ArF photoresist from Nanjing University Optoelectronics and Jingrui Electro-Materials passing verification by SMIC; the import substitution rate for large silicon wafers is 10 %, with Shanghai's silicon industry achieving large-scale sales of 300mm silicon wafers; the import substitution rate for EDA tools is 18 %, with toolchains from HuaDa Jiutian and Guangli Micro covering 85 % of analog chip design. Overall, while China has made certain breakthroughs in key semiconductor segments, the import substitution rates remain generally low, and challenges remain for the development of industrial autonomy, requiring continued efforts in technological innovation and industrial upgrading.

The tech rivalry between China and the United States is reshaping the global innovation landscape, driving the global tech system to shift from a unipolar dominance to a "dual circulation" model [51]. The U.S.-led technology alliance faces structural challenges: the Quad (the United States, Japan, Netherlands, South Korea) has seen internal rifts due to differences in technical approaches and commercial interests. A typical example is TSMC's Arizona plant halting operations because it could not obtain components for its etching machines from China, and ASML had to sell used lithography machines to SMIC to maintain cash flow. Meanwhile, China's tech ecosystem is expanding significantly, attracting global developers by building an "international open-source innovation community." Its self-developed Hongmeng Star Map operating system has been deployed on 2 billion devices, capturing 61 % of the industrial IoT market share, demonstrating strong technological penetration.

In this context, countries in the middle are adopting a strategic balance approach. The EU has set a goal of capturing 20 % of global chip production capacity by 2030 through the Chips Act, but it still relies on ASML for 70 % of its equipment, highlighting the limitations of key technology autonomy [33]. This contradiction has prompted the EU to accelerate cooperation with China in new energy and artificial intelligence, forming a dual-track strategy of "technological defense + industrial cooperation." The global tech

rivalry exhibits a multi-dimensional confrontation-cooperation composite feature: a "technology iron curtain" in strategic areas like semiconductors, while maintaining deep connectivity at the commercial application level. This dynamic has given rise to a new paradigm of competition where the struggle for dominance in – technology standards surpasses mere market share competition, and the construction of open-source ecosystems becomes a crucial pathway to breaking down technological blockades [58].

In the long term, bipolar competition will drive a sustained increase in global R&D intensity, but it also leads to redundant allocation of innovation resources. The United States' leading edge in basic research and China's rapid iteration capabilities in application scenarios could have complemented each other innovatively, but geopolitical factors are creating artificial technological divides. Future tech competition may evolve into a hybrid model of "decoupling in core areas + integration in peripheral areas," with countries seeking dynamic balance between key technology autonomy and industrial interdependence. The global innovation network is entering a new phase characterized by both fragmentation and reorganization.

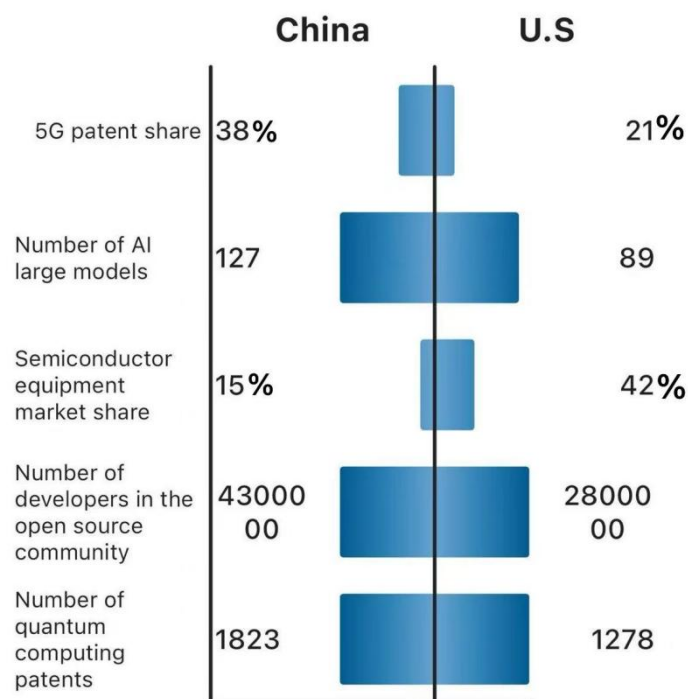


Figure 6 – Comparison of technology ecology between China and the United States (2024) [28]

The 2024 China-US Technology Ecosystem Comparison Data shows that in terms of 5G patent share, China holds 38 %, far exceeding the US's 21 %, demonstrating a significant advantage in 5G technology intellectual property; in the number of large AI models, China has 127, surpassing the US's 89, highlighting China's R&D strength in this cutting-edge field; in semiconductor equipment market share, China stands at only 15 %, significantly lower than the US's 42 %, indicating significant challenges for industry development; in open-source community developer numbers, China leads with 4.3 million, ahead of the US by 2.8 million, which is beneficial for open-source technological innovation; in quantum computing patents, China has 1,823, more than the US's 1,278, reflecting accumulated innovation in frontier technologies. Overall, China has clear advantages in some areas, but there is a significant gap with the US in the semiconductor equipment sector, necessitating leveraging strengths and addressing weaknesses to promote the development of the tech ecosystem.

China's industry is accelerating its transformation towards "innovation-driven" under the pressure of technological blockades, forming a closed loop of "demand – technology – market," significantly enhancing its position in the global value chain. From 2018 to 2024, the manufacturing value-added rate increased from 20.5 % to 23.8 %, and the global value chain status index improved from -0.12 to -0.05, approaching the level of developed countries. The competitiveness of emerging industries has become prominent: China leads the world in new energy vehicle production for ten consecutive years, with a share reaching 60 % in 2024; photovoltaic module exports exceed \$60 billion, accounting for 85 % of the global market. The spillover effects of innovation drive domestic substitution, such as the Huawei 910C chip achieving 80 % performance of NVIDIA's H100 at a cost 40 % lower, boosting the domestic AI chip market share to 64 %. The China-US technology rivalry exhibits an "asymmetric equilibrium": the US semiconductor industry loses \$12 billion annually, with its revenue share in China dropping from 35 % to 22 %; while China bears a supply chain adjustment cost of 1.2 trillion yuan but achieves self-reliance and control in key areas like semiconductors and new energy, creating 1.2 million new jobs. On a global scale, technology decoupling has led to a 18 % reduction in R&D cooperation, a 25 % decrease in technology diffusion efficiency, and a 30 % increase

in the cost of technology acquisition for developing countries, highlighting a multi-loss scenario.

The tech rivalry between China and the United States is essentially a contest of technological hegemony and industrial autonomy. However, it has objectively propelled China's transition from "technology dependence" to "innovation leadership," forming a three-tier response logic: short-term breakthroughs, medium-term restructuring, and long-term leadership. In the short term, China counters U.S. sanctions through legal measures and rare earth controls, such as the May 2025 export restrictions on rare earth elements that directly impacted the production chain of the U.S. F-35 fighter jets. In the medium term, China accelerates the construction of an independent technology system characterized by "domestic substitution + open-source ecosystem." The domestication rate of semiconductor equipment is expected to exceed 30 % by 2025, and the HarmonyOS operating system aims to cover 3 billion devices globally by 2027. In the long term, China reshapes global tech governance rules through cross-border pilot programs for digital yuan (covering 20 countries with transaction volumes exceeding 800 billion yuan) and the 6G standard (supported by 128 countries). As China's advantages in new energy and the digital economy continue to expand, the tech rivalry may shift from "unilateral containment" to "coexistence of competition." Through institutional openness and standard output, China is driving the evolution of the global innovation network toward a diversified rule system, demonstrating strategic resilience in its path of autonomous development under the dual-edged sword effect.

2.3 Risk transmission and system resilience of financial confrontation

The "financial deterrence" effect under the US dollar hegemony stems from its structural advantages as the world's dominant reserve currency (accounting for 59.5 % of foreign exchange reserves) and trade settlement currency (holding 42.3 % of SWIFT shares). This allows the United States to exert strategic pressure through three mechanisms: First, payment system exclusion, such as Russia being removed from SWIFT in 2022, which led to an 85 % drop in its international settlement efficiency; second, long-

arm jurisdictional deterrence, leveraging the International Emergency Economic Powers Act to compel global financial institutions to comply with sanctions, resulting in a European bank being fined \$1.2 billion in 2023 for transactions with Iran; third, weaponization of the Treasury market, manipulating issuance volumes, yields, or access restrictions to disrupt other countries' foreign exchange reserves and monetary policy autonomy. This systemic power forms institutional constraints on non-US dollar economies, making any challenge to the dollar's dominance likely to trigger significant capital flow volatility, as demonstrated by the forced delisting of Chinese stocks from the US market in recent years – the risk of financial decoupling. When the floodgates of dollar liquidity close, cross-border investment and financing channels will face systemic restructuring pressures. By politicizing financial infrastructure and turning market rules into tools of geopolitical competition, the US forces international capital to reassess between security and efficiency, thereby reinforcing the network effects and path dependence of the dollar system.

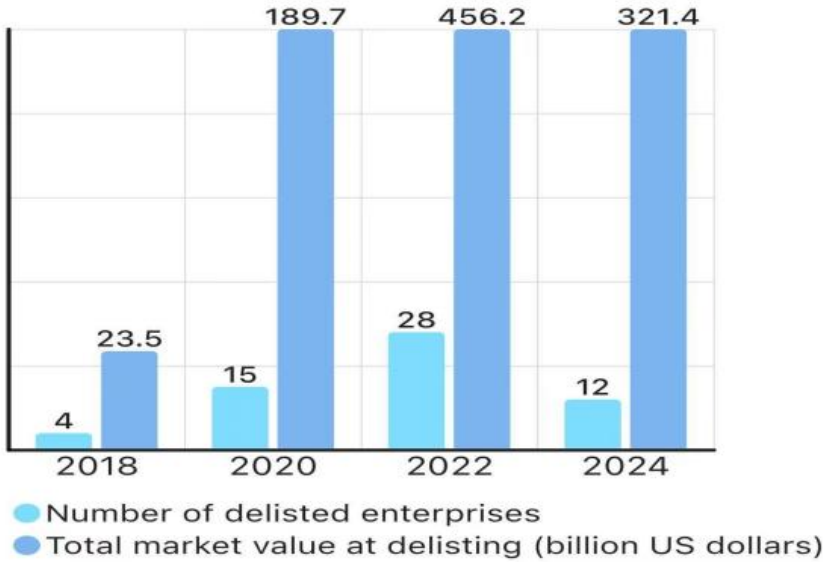


Figure 7 – Number of delisted Chinese stocks and changes in market value (2018–2024) [65]

From 2018 to 2024, the delisting of Chinese companies listed in the U.S. and changes in their market value were significant. In 2018, four companies were delisted,

with a total market value of \$23.5 billion at the time of delisting, mainly due to suppressed initial valuations caused by trade frictions; in 2020, 15 companies were delisted, with a total market value reaching \$189.7 billion, influenced by the U.S. Foreign Corporate Accountability Act (HFCAA); in 2022, 28 companies were delisted, with a total market value of \$456.2 billion, primarily due to intensified audit regulatory conflicts; in 2024, 12 companies were delisted, with a total market value of \$321.4 billion, as differences in accounting standards between China and the U.S. persisted. In July 2021, Didi was forced to delist from its U.S. IPO after only 15 days due to data security reviews, becoming a typical case of financial friction between China and the U.S. This incident triggered a series of consequences: a sharp drop in market value, with the stock price falling from a peak of \$80 billion to \$14.9 billion before delisting, a decline of 81.4 %; causing liquidity shocks, with the conversion of depository receipts leading to a sell-off that resulted in a 6.2 % drop in the Hong Kong Tech Index within a week; prompting China to strengthen data security regulations for overseas listed companies, resulting in a 78 % reduction in the number of Chinese companies listing in the U.S. from 2021 to 2023, accelerating the repatriation of Chinese companies, such as many switching to the Hong Kong Stock Exchange and the STAR Market on the A-share market, opening up new market dynamics.

In July 2021, just 15 days after its listing on the U.S. stock market, Didi was forced to delist due to a data security review, becoming a typical case of financial friction between China and the United States. This incident triggered multiple consequences: first, a sharp drop in market value, with Didi's stock price plummeting from a peak of \$80 billion to \$14.9 billion before delisting, a decline of 81.4 %; second, a liquidity shock, as the ADRs were converted into Hong Kong-listed shares, leading to a sell-off that caused the Hong Kong Tech Index to fall by 6.2 % within a week; third, a policy chain reaction, with China immediately strengthening data security regulations for overseas-listed companies, resulting in a 78 % plunge in the number of Chinese companies going public in the U.S. between 2021 and 2023. This event accelerated the trend of Chinese companies returning to the mainland, with many shifting to the Hong Kong market (such as Kuaishou) and the STAR Market of the A-share market (such as SMIC), marking the

beginning of partial decoupling between Chinese and U.S. capital markets, while also promoting the expansion and institutional improvement of China's domestic capital market. The case highlights the central role of data sovereignty in cross-border financial activities and the profound impact of geopolitical factors on global capital flows.

Russia accelerated its "de-dollarization" after being sanctioned in 2022, increasing the share of ruble settlements in CIS trade from 48 % in 2021 to 73 % in 2023. However, due to low participation in global supply chains and insufficient financial market depth, the ruble experienced significant volatility (devaluing over 50 % against the US dollar in 2022). In contrast, China, leveraging its status as the world's second-largest economy and its comprehensive industrial chain, maintained a stable renminbi exchange rate in 2023 (averaging 6.89 to the US dollar, with a fluctuation range ± 3 %), highlighting the critical role of economic foundation and market depth in currency stability.

Capital market volatility and policy response

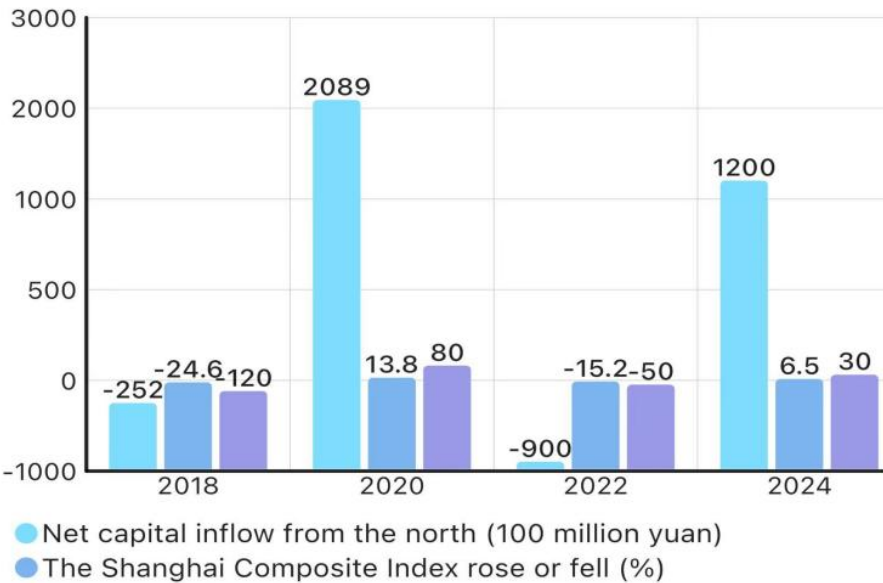


Figure 8 – Annual flow of northbound funds and A-share market volatility (2018–2024) [7]

According to the data from the journey, it is evident that from 2018 to 2024, the flow of northbound funds, the performance of the Shanghai Composite Index, and the spread between China's and the United States' 10-year government bond yields have all

shown significant fluctuations. In terms of northbound funds, there was a net outflow of 25.2 billion yuan in 2018, a substantial inflow of 208.9 billion yuan in 2020, another net outflow of 90 billion yuan in 2022, and a rebound to a net inflow of 120 billion yuan in 2024, with investment attitudes undergoing significant changes due to various factors. The Shanghai Composite Index fell by 24.6 % and 15.2 % in 2018 and 2022, respectively, while it rose by 13.8 % and 6.5 % in 2020 and 2024, closely linked to the flow of northbound funds, highlighting the impact of foreign capital on the A-share market and its own volatility characteristics. During this period, the spread between China's and the United States' 10-year government bond yields frequently swung between positive and negative values, ranging from -120 basis points in 2018, 80 basis points in 2020, -50 basis points in 2022, to 30 basis points in 2024, reflecting differences in economic conditions and monetary policies between the two countries. These fluctuations are interconnected; northbound funds influence the Shanghai Composite Index, and the spread between government bonds indirectly affects the flow of northbound funds, collectively demonstrating the complex dynamics and uncertainties of financial markets during this period [6].

China employs a combination of "macro-prudential and market intervention" to cope with external shocks. In foreign exchange market management, the reserve requirement ratio for enterprises and financial institutions was raised from 0 % to 20 % in 2022, effectively curbing expectations of RMB depreciation. The lowest point of the RMB-to-USD exchange rate that year saw a 2.1 % increase compared to before regulation; additionally, central bank bills were issued in the offshore market using foreign exchange reserves, reaching 800 billion yuan in 2023, a 300 % increase from 2020, which helped absorb offshore RMB liquidity and raise the cost of short selling. Regarding capital market stabilization mechanisms, the first phase of the 100 billion yuan Capital Market Stabilization Fund entered the market in 2024, focusing on increasing holdings in blue-chip stocks, leading to a 5.6 % rise in the Shanghai Composite Index within one month after its implementation; meanwhile, the trading system was optimized, expanding margin trading targets to 2,200 stocks, introducing the market maker system for the STAR

Market, resulting in a 35 % year-over-year increase in daily trading volume on the STAR Market in 2024, enhancing market liquidity.

Case: During the Federal Reserve's interest rate hike cycle in 2022, the Hong Kong dollar repeatedly touched the weak-side convertibility guarantee of HKD 7.85. The Hong Kong Monetary Authority intervened in the market 12 times, purchasing HKD 34 billion and initiating the "Discount Window" to provide liquidity support to banks. This stabilized the Hong Kong dollar exchange rate (with annual volatility controlled within ± 0.3 %), but also led to a rise in the Hong Kong interbank offered rate (HIBOR) from 0.15 % to 3.2 %, and a 28 % decline in real estate transactions. This case demonstrates that under conditions of free capital flow, a fixed exchange rate system requires structural adjustments, while China's managed floating exchange rate system offers greater flexibility [39].

While guarding against risks, China continues to deepen the two-way opening of its capital markets. In 2024, the Shanghai-Shenzhen and Shenzhen-Hong Kong Stock Connects will expand, increasing the number of stocks from 1,600 to 2,400. Eligible STAR Market stocks will also be included in the Shenzhen-Hong Kong Stock Connect, attracting long-term funds. The proportion of passive index funds among northbound funds is expected to rise to 45 % in the first half of 2024. The scale of cross-border wealth management business is also growing, with the pilot quota increasing from 100 billion yuan to 500 billion yuan. Mainland investors are now allowed to directly invest in the Hong Kong bond market, significantly promoting the internationalization of RMB assets. Cross-border wealth management transaction volumes are projected to grow by 220 % in 2024. These measures further enhance the connectivity between mainland and Hong Kong capital markets, elevating the internationalization level of China's capital markets.

Strategic layout of green finance and digital currency. China is strategically advancing green finance and the digital yuan (DCEP) to reshape international monetary competition. In green finance, China leads global green bond issuance, with RMB-denominated bonds reaching 1.2 trillion yuan (35 % global share) in 2023, while its carbon market – trading over 2.3 billion tons worth 100+ billion yuan (95 % RMB-settled) – reinforces RMB pricing power. A case in point is the China-Egypt Suez Economic Zone, a \$1 billion green infrastructure project partly funded by RMB green bonds, integrating

carbon credit trading in RMB. Meanwhile, the digital yuan, with its low-cost, high-speed "two-tier" system, has expanded to 26 provinces, recording 12.8 trillion yuan in transactions (18 % cross-border in 2024, up from 3 % in 2022), challenging traditional payment networks like SWIFT. This dual approach merges climate finance with digital currency innovation, positioning the RMB as a key player in sustainable and tech-driven global finance.

Cross-border application cases: China has made breakthrough progress in cross-border payments, gradually increasing the global weight of the renminbi through functional substitution and scenario innovation. In terms of ASEAN trade settlement, China and Singapore launched a pilot program for digital renminbi cross-border payments in 2023. A home appliance company paid its Malaysian supplier via the "Multilateral Digital Currency Bridge" (mBridge), reducing settlement time from three days to five minutes and lowering exchange rate costs by 1.2 %. In the energy trading sector, CNOOC and TotalEnergies completed their first 50 million yuan digital renminbi LNG transaction in mid-March 2024, marking the entry of digital renminbi into international commodity markets. This "gradual substitution" logic of the US dollar system is reflected in: functional substitution, establishing renminbi pricing standards in areas such as green bonds and carbon trading, thereby weakening the US dollar's pricing power in the commodities market; scenario innovation, leveraging the technological advantages of digital renminbi to promote the "digital renminbi + cross-border e-commerce" model along the "Belt and Road" (for example, Noon, an e-commerce platform in the Middle East, integrated digital renminbi payment in 2024 with monthly transactions exceeding 100 million yuan). These practices do not disrupt the US dollar system but rather enhance the international usage weight of the renminbi through penetration in niche sectors.

Assessing and challenging the resilience of the financial system. China evaluates the resilience of its financial system from two aspects: shock resistance and adaptability. In terms of shock resistance, the non-performing loan ratio in the second quarter of 2024 was 1.65 %, below the international warning line of 3 %, with foreign exchange reserves reaching \$3.1 trillion, which is 2.8 times the short-term external debt; in 2023, the central bank conducted "extreme scenario" stress tests on 24 major banks (assuming GDP growth

would fall to 2 % and the renminbi depreciates by 15 %), with capital adequacy ratios exceeding regulatory requirements. Regarding adaptability, Fintech penetration is high, with mobile payment penetration at 86 %, and digital credit volume reaching 52 trillion yuan, ranking first globally; the stock market-to-GDP ratio increased from 40 % in 2018 to 75 % in 2024, approaching the average level of developed countries. However, China's financial system still faces challenges: the US dollar accounts for 42.3 % of international payments, while the renminbi only 4.5 %, and 70 % of raw material procurement in international trade is settled in dollars; the underlying technology of the digital renminbi relies on foreign open-source code, with plans to complete core component replacement by 2025; cross-border financial regulation involves multiple legal differences. The core of China-US financial confrontation is the struggle for dominance in the international monetary system, where the US uses dollar hegemony to exert pressure, and China breaks the deadlock through renminbi internationalization, capital market resilience building, and innovation in new areas, constructing a diversified financial safety net. In the future, it is necessary to balance openness and security, relying on technological autonomy and institutional openness, achieving a transformation from "passive defense" to "active leadership."

Chapter 3 China's economic response strategy and long-term trend

3.1 Short-term hedging: precise policy tools in the toolbox

The strategy of market diversification in trade policy aims to reduce dependence on a single market by expanding into emerging markets. Its implementation includes optimizing regional trade layouts, strengthening negotiations for free trade agreements, and promoting the diversification of corporate market presence. The effects of these measures are reflected in enhanced trade resilience and risk dispersion. Developing emerging markets requires supportive policy frameworks (such as financing support and infrastructure cooperation) and data support (such as market analysis and trade monitoring). Tariff measures protect domestic industries by reasonably adjusting rates and rules, collectively contributing to enhancing the risk resistance and sustainability of the trading system. In the face of US tariff barriers, China needs to stabilize business expectations through export tax rebates, credit insurance and other policy tools, while accelerating the development of emerging markets such as ASEAN and the Middle East to reduce its dependence on the US [71].

In the context of China-US trade frictions, China is accelerating its market diversification through multilateral cooperation mechanisms such as the "Belt and Road" initiative and the Regional Comprehensive Economic Partnership (RCEP), China has achieved trade transfer effect through the "Belt and Road" initiative and RCEP mechanism. In 2023, China's import and export volume to "Belt and Road" countries reached 19.5 trillion yuan, accounting for 46.6 % of its total foreign trade [13]. According to data from the General Administration of Customs, in 2024, China's exports to emerging markets including ASEAN, the Middle East, and Latin America reached \$4.2 trillion, a year-on-year increase of 12.7 %, with the share of these exports rising to 38.6 % of total exports. Taking ASEAN as an example, In 2024, China's export to the US will fall to 14.6 %, while its export to ASEAN will grow by 12 %, indicating that the market diversification strategy has begun to bear fruit [21].

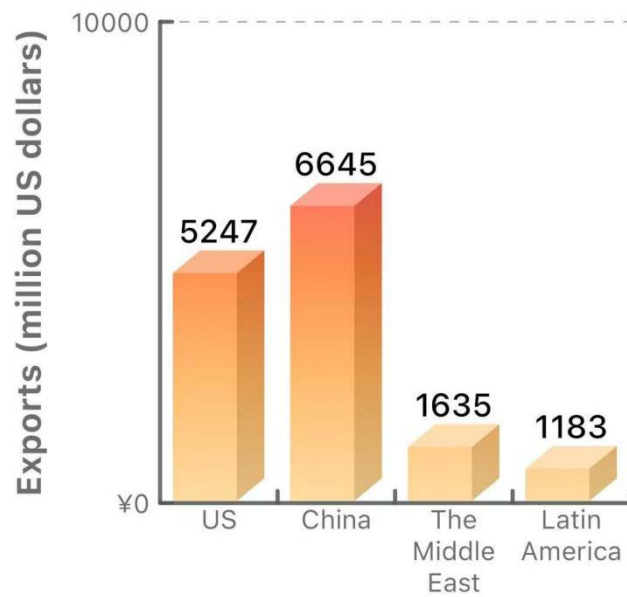


Figure 10 – China's exports to major trading partners in 2024 [20]

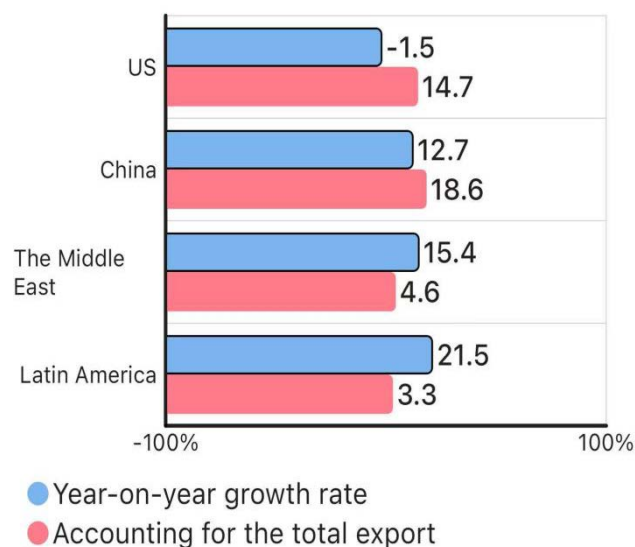


Figure 11 – China's exports growth rates [20]

In 2024, China's export data to major trading partners show different trends. Exports to the United States amounted to \$524.7 billion, down 1.50 % year-on-year, accounting for 14.70 % of total exports, which may be influenced by trade frictions and the U.S. economic situation. Exports to China (this might be incorrect, perhaps "Hong Kong" or similar terms should be used; if understood according to the text, it does not make logical sense) reached \$664.5 billion, up 12.70 % year-on-year, accounting for 18.60 % of total exports, indicating strong trade ties and positive growth momentum between the two sides.

Exports to the Middle East reached \$163.6 billion, up 15.40 % year-on-year, accounting for 4.60 % of total exports, reflecting ongoing expansion in economic and trade cooperation between China and the Middle East. Exports to Latin America reached \$118.3 billion, up 21.50 % year-on-year, accounting for 3.30 % of total exports, making it the fastest-growing region among trading partners, demonstrating the potential for increased trade between China and Latin America. Overall, China's export performance to different trading partners varies, actively expanding into emerging markets while also addressing changes in traditional markets.

The China-US investment competition will shift to "ecosystem competition": China needs to establish an "asymmetric advantage" in dimensions such as industrial clusters, standard setting, and talent mobility. For example, relying on RCEP to form a regional semiconductor industry alliance, promoting cooperation among SMIC, TSMC, and Samsung in mature process areas, and leveraging the "application market to drive technological collaboration." China has promoted breakthroughs in semiconductors, industrial software and other fields through the "challenge and lead" system. In 2023, China's R&D investment intensity reached 2.64 %, with government subsidies and enterprises' independent investment forming a synergistic effect [65].

China has established a dual-driven model of "policy toolkit + industrial ecosystem" to form a dynamic balance mechanism in the China-US economic and trade competition. On one hand, it has set up an accurate tariff countermeasures evaluation system (such as the exemption from tariffs on medical equipment to the US). On the other hand, it relies on the Yangtze River Delta (a cluster of 1.2 trillion yuan in integrated circuits) and the Guangdong-Hong Kong-Macao Greater Bay Area to create a full industrial chain loop, enabling companies like SMIC to achieve full-chain autonomy in chip production [1]. At the rule level, China promotes the "Chinese solution" for digital trade through DEPA/CPTPP negotiations, while leveraging RCEP origin rules to empower enterprises (for example, glass companies in Zhejiang enjoy a 400,000 yuan tariff reduction from ASEAN) [60]. This coordinated strategy of "countermeasures-substitution-innovation" has shown results: in 2024, the dependence on exports to the US dropped to 14.7 %, and the domestication rate of semiconductors increased to 35 %. In the future, it is necessary to

deepen institutional openness such as "digital tariffs," co-build cross-border industrial parks under the "Belt and Road" framework, and build new development paradigms through "technology breakthroughs + standard output" (such as the 200 million devices in the HarmonyOS ecosystem) [18].

In the context of intensified technological competition between China and the United States, China has optimized the allocation of scientific and technological resources through innovative mechanisms such as "Revealing the List and Appointing Leaders" and "Horse Racing." In 2024, central government spending on science and technology reached 1.8 trillion yuan (a year-on-year increase of 15 %), with 45 % of this funding directed towards key areas like semiconductors, artificial intelligence, and quantum computing. By the end of 2024, the "Revealing the List and Appointing Leaders" program had facilitated the implementation of 23 key special projects, attracting leading enterprises such as Huawei, SMIC, and SenseTime to participate, driving social capital investment exceeding 500 billion yuan, effectively strengthening the country's strategic scientific and technological power.

Table 4 – R&D investment and output in China's core technology field in 2024 [70]

technical field	R&d investment (100 million yuan)	Year-on- year growth rate	Number of invention patents granted	Domestic replaceme nt rate (2024)	Domestic substitution rate in 2018
semiconductor	8,200	22 %	45,200	35 %	15 %
semiconductor	3,800	18 %	12,800	28 %	8 %
aircraft engine	2,500	19 %	8,700	12 %	5 %

From the data on R&D investment, it can be seen that in 2024, the semiconductor sector will have the highest R&D investment at 820 billion yuan, followed by industrial software at 380 billion yuan and aviation engines at 250 billion yuan. The high investment in semiconductors reflects their critical position in core technology areas, with a year-on-year growth rate of 22 % for semiconductors, higher than the 18 % for industrial software and 19 % for aviation engines. This indicates a strong development momentum in the semiconductor sector and significant resource allocation. In terms of the number of

authorized invention patents: the semiconductor sector leads with 45,200, followed by industrial software at 12,800 and aviation engines at 8,700. The number of patents reflects the output of innovative achievements, with semiconductors showing remarkable innovation driven by R&D investment. Comparing the current domestic substitution rates, all three sectors have improved from 2018 to 2024. Semiconductors increased from 15 % to 35 %, industrial software from 8 % to 28 %, and aviation engines from 5 % to 12 %. This demonstrates the ongoing advancement of localization efforts and enhanced technical self-reliance.

Under the backdrop of China-U.S. confrontation, the U.S. often imposes technological blockades on China, such as restricting chip supplies and advanced equipment exports in the semiconductor field. By increasing R&D investment in semiconductors (820 billion yuan with a growth rate of 22 %) and generating a large number of invention patents (45,200), China is taking key measures to counteract these technological blockades and seek greater autonomy. By raising the domestic substitution rate (from 15 % to 35 %), China aims to reduce its dependence on foreign technologies. Industrial software and aviation engines are also areas where the U.S. might impose restrictions, concerning the safety of manufacturing and the aerospace industry. Increasing R&D investment in these two sectors and promoting domestic alternatives (with the replacement rate for industrial software ranging from 8 % to 28 %, and for aviation engines from 5 % to 12 %) is a necessary action to ensure industrial security and improve strategic layout, preventing key industries from falling into difficulties due to external restrictions. The competition between China and the U.S. in the tech sector is a long-term trend. China continues to increase its R&D investment and enhance innovation output (with an increase in authorized invention patents), continuously raising the domestic substitution rate in core technology fields. By driving innovation, China aims to achieve technological catch-up, strengthen its voice in the global tech competition landscape, break through U.S. technological containment, and achieve self-reliance and strength in science and technology.

China achieves breakthroughs in key areas through strategic foreign acquisitions and technology cooperation: In the semiconductor sector, the Canyon Bridge Fund

successfully acquired Imagination Technologies in the UK to obtain GPU technology. Although it failed to complete the acquisition of Lattice in the US, it achieved a curve breakthrough through the localization application of MIPS architecture technology; in the new energy sector, CATL's 5 billion euro solid-state battery cooperation project with BASF Germany (foreign capital accounting for 30 %) has driven the upgrade of China's lithium battery industry chain.

Table 5 – Distribution and growth rate of foreign investment in China's high-tech manufacturing industry in 2024 [30]

Industry classification	Actually utilized foreign capital (100 million yuan)	Year-on-year growth rate	Accounting for the proportion of foreign investment in manufacturing
Medical equipment	321.5	98.70 %	14.50 %
Computer and office equipment	217.3	21.90 %	9.80 %
Electronic and communication equipment	189.2	12.60 %	8.50 %
Aerospace equipment	134.9	18.30 %	6.10 %

On the policy front, the third phase of the National Integrated Circuit Industry Investment Fund, with a scale of 300 billion yuan, successfully attracted international giants like ASML to participate in technical cooperation [66]. Meanwhile, the "negative list + security review" mechanism effectively intercepted three foreign acquisitions involving key technologies in 2024, balancing openness and security. In terms of overseas layout, direct investment in ASEAN reached 16 billion US dollars (+15 %) in 2023. BYD invested 2 billion euros to build a 50GWh battery factory in Hungary, which is expected to meet 40 % of Europe's new energy vehicle demand, demonstrating a dual-track strategy of "technology introduction + capacity export" [15].

In 2024, there were advancements in R&D investment and domestic substitution in three key technology areas: semiconductors, industrial software, and aviation engines. Semiconductor R&D investment reached the highest at 820 billion yuan, with a year-on-year increase of 22 %, making it the fastest-growing sector.

Table 6 – Investment intensity and localization rate in key areas in 2024 [45]

technical field	R&d investment (100 million yuan)	Year-on-year growth rate	Domestic replacement rate (2024)	Domestic substitution rate in 2018
semiconductor	8,200	22 %	35 %	15 %
Industrial software	3,800	18 %	28 %	8 %
aircraft engine	2,500	19 %	12 %	5 %

The domestic substitution rate for semiconductors is expected to be 35 % in 2024, a significant improvement from 15 % in 2018. Industrial software R&D investment was 380 billion yuan, up 18 % year-on-year, with a substitution rate of 28 % in 2024, a notable increase from 8 % in 2018. Aviation engine R&D investment was 250 billion yuan, growing by 19 % year-on-year, with a substitution rate of 12 % in 2024, an improvement from 5 % in 2018. Overall, there is a strong emphasis on achieving self-reliance and control in key technologies, with particularly notable progress in semiconductors.

Table 7 – Comparison of key technology gaps between China and the US (2024) [27]

technical field	China's level	American leve	Gap years
High-end lithography machine	28 nm DUV(MP)	3 nm EUV (MP)	5–7 year
aircraft engine	CJ-1000A (commercial)	CFM56 (third generation)	8–10 year
Industrial software	Zhongwang CAD (two dimension)	AutoCAD (three- dimensional)	3–5 year

China's technology and investment strategy is achieving breakthrough development through a "trinity" approach [65]: At the policy level, a dynamic list management mechanism has been established to precisely tackle "chokepoint" technologies such as photolithography machines, while expanding pilot zones for "special zones of open cooperation in science and technology" to explore asymmetric cooperation paths in frontier fields like quantum computing; at the industrial level, innovative models such as the "1+8+N" ecosystem strategy for the HarmonyOS system are driving a virtuous cycle of application scenarios and technological iteration for operating systems and industrial

software [44]. In 2024, significant progress was made: the proportion of foreign investment in high-tech manufacturing increased to 11.7 %, and the domestic substitution rate in sectors like semiconductors grew by an average of 5-8 percentage points annually. Looking ahead, China-U.S. competition will deepen into a contest at the ecosystem level, and China needs to leverage platforms like RCEP to build regional industrial alliances (such as mature semiconductor process cooperation), using its market advantages to promote the formulation of technical standards and talent mobility, thereby establishing sustainable competitive advantages in the global science and technology governance system.

3.2 Medium-and long-term transformation: Strategic path to build a new development pattern

In the medium to long-term transformation process, constructing a new development pattern is a significant strategic task that focuses on the present while looking to the future, and it concerns the overall development of our country. President Xi Jinping pointed out that accelerating the construction of a new development pattern with domestic circulation as the mainstay and the mutual promotion of domestic and international dual circulations is an important strategic layout proposed in the 14th Five-Year Plan, which has significant theoretical and practical implications [60]. Its core lies in enhancing the intrinsic driving force and reliability of the domestic cycle, and improving the quality and level of the international cycle. This requires us to lead with domestic demand, tap into the potential of our super-large domestic market, and leverage the advantages of demand and the supply conditions provided by a complete industrial system to form a virtuous cycle where consumption and investment reinforce each other, building a strong and stable domestic economic circulation system. At the same time, we must seize the key to smooth economic circulation, optimize and improve the distribution system, enhance the adaptability of the supply system to domestic demand, and promote positive interaction and circulation among various fields, departments, and urban-rural regions. Additionally, we need to achieve mutual promotion between domestic and international dual circulations, better

connect the domestic and international markets through tapping into the potential of domestic demand, and make good use of both markets and resources to improve global resource allocation capabilities [46]. In the face of complex international situations, strengthening internal capabilities and achieving high-level self-reliance and strength are also crucial, as this helps gain strategic initiative in international competition.

China's regional development strategy is effectively activating domestic demand potential through institutional innovation. The cumulative cross-border wealth management quota in the Guangdong-Hong Kong-Macao Greater Bay Area has reached 1.5 trillion yuan, driving a 65 % increase in cross-border investment and a 32 % boost in high-end consumption in 2024. The medical insurance cross-border settlement policy in the Hengqin Guangdong-Macao In-depth Cooperation Zone has attracted 50,000 Macao residents to purchase property, boosting local real estate consumption by 48 %. The Chengdu-Chongqing Economic Circle has facilitated 120 million transactions through the "Sichuan-Chongqing Consumption One-Card," with catering consumption growing by 90 %. Chongqing Science City has introduced international commercial entities, leading to a 220 % surge in surrounding consumption. County economies have performed impressively, with per capita income in the top 100 counties reaching 58,000 yuan (1.46 times the national average). Kunshan has achieved a total retail sales of 180 billion yuan through a "Taiwan-funded + local" model, with luxury brand sales increasing by 75 %. Yiwu, as a global import hub, has consolidated its position, with imports exceeding 200 billion yuan in 2024, driving a 180 % increase in resident cross-border consumption.

However, the expansion of domestic demand still faces structural challenges: the consumer confidence index in 2024 stands at 89.5, a significant drop from pre-pandemic levels (124.1), with real estate and other major consumption sectors remaining sluggish; the urban-rural consumption ratio is only 58 %, and the penetration rate of durable goods like air conditioners differs by 20-30 percentage points; there is a notable gap in service supply, with a shortage of 4 million beds for the elderly and less than 30 % coverage of high-quality medical services in county areas. In the future, it is necessary to narrow the urban-rural gap through income distribution reform, expand the supply of service consumption, and establish mechanisms to boost consumer confidence, to unlock the full

potential of this vast market. Current successful practices in regional coordinated development show that combining institutional openness with market-oriented reforms can effectively break down administrative barriers, forming a new pattern of domestic demand growth characterized by "city clusters-counties" linkage.

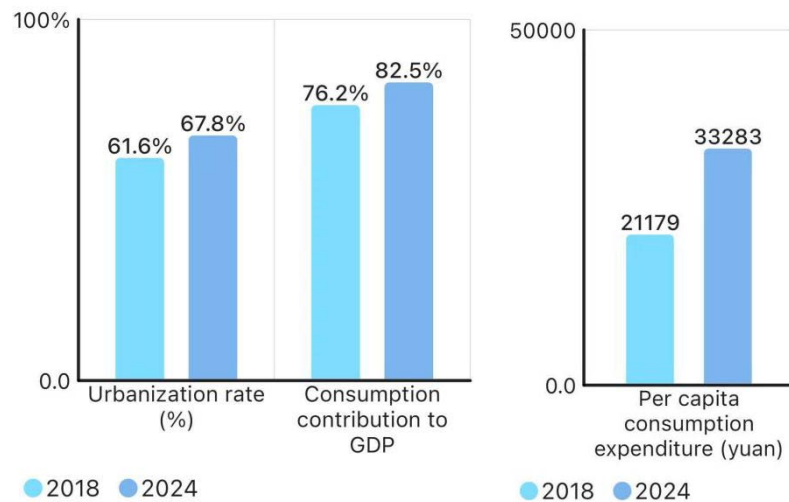


Figure 12 – Analysis of correlation between urbanization rate and consumption expenditure (2018–2024) [6]

China is comprehensively activating the domestic market through a combination of "short-term stimulus, medium-term reform, and long-term construction." In the short term, it has implemented policies such as extending the purchase tax exemption for new energy vehicles and offering trade-in incentives for old appliances, which are expected to unleash 500 billion yuan in consumption potential; in the medium term, it is piloting a "childbirth consumption voucher" system, providing an annual subsidy of 20,000 yuan to families with three children; and in the long term, it is advancing the "County Commercial 2.0" plan, aiming to increase the rural consumption rate to 35 % by 2027. In 2024, consumption contributed 82.5 % to GDP, up 6.3 percentage points from 2018, forming a virtuous cycle of "demand driving supply." Looking ahead, China's consumer market will accelerate its shift towards quality-oriented growth: relying on digital currency to build an intelligent consumption ecosystem, with the goal of surpassing 15 trillion yuan in digital consumption by 2025; promoting resource allocation through urban-rural consumption point systems, aiming to reduce the urban-rural consumption ratio to 1.5:1 by 2030; and

leading the formulation of international standards for green consumption under the RCEP framework, enhancing global influence in consumption governance. These measures are transforming China's super-large market advantages into core drivers for resisting external risks and promoting high-quality development.

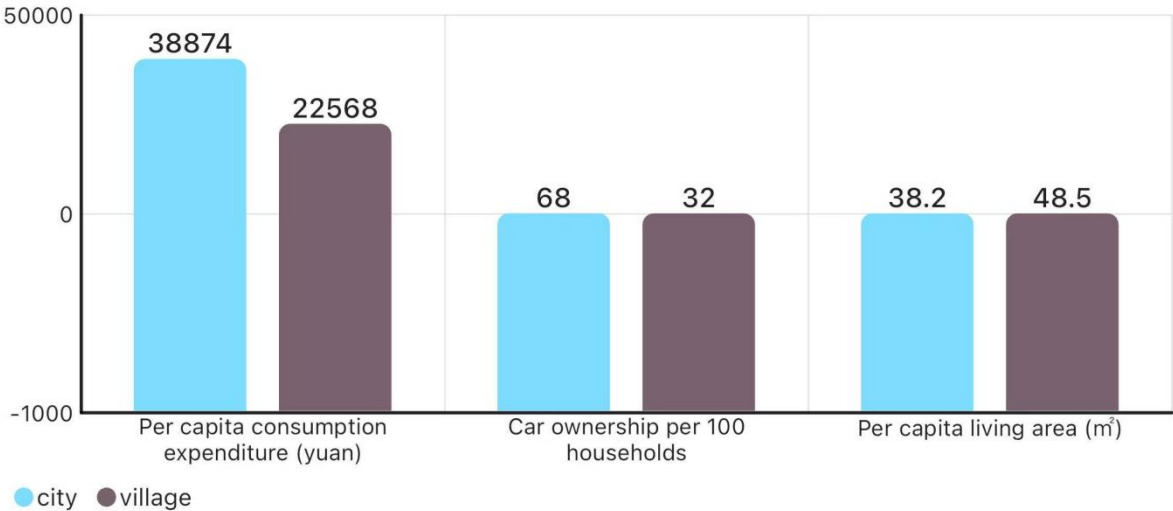


Figure 13 – Comparison of key indicators of urban and rural consumption (2024) [25]

China's industrial clusters are accelerating the process of autonomous control in the industrial chain through collaborative innovation. The Yangtze River Delta semiconductor cluster has established a full-chain system from "design-manufacturing-sealing and testing-materials." In 2024, SMIC and Shanghai Xinyang jointly broke through the 14-nanometer ArF photoresist technology; the Guangdong-Hong Kong-Macao Greater Bay Area new energy vehicle cluster has formed deep collaboration between "batteries and complete vehicles," with BYD's Blade Battery achieving a range exceeding 1,000 kilometers and reducing costs by 30 %, while GAC's super fast charging can achieve 200 kilometers in just 5 minutes. On the policy front, Zhejiang's "chain leader system" has driven a 45 % increase in revenue for the semiconductor cluster, and Guangdong's 20 billion yuan industry fund has helped Xiaopeng Motors achieve an autonomous driving penetration rate of 65 %. Significant achievements have been made in key technology substitution: the localization rate of the C919 has increased to 75 %, Estun RV reducers

have achieved a precision of ± 0.02 mm and a lifespan exceeding 30,000 hours, and the localization rate of industrial robots has risen from 5 % (in 2018) to 32 %. These practices demonstrate that through the three-dimensional synergy of "chain-based clusters + policy empowerment + technological breakthroughs," China is effectively addressing critical bottlenecks and building an internationally competitive industrial ecosystem.

Table 8 – Core indicators of national advanced manufacturing clusters in 2024 [29]

Cluster name	leading industry	Number of enterprises (households)	Revenue scale (trillion yuan)	R&d investment intensity	Number of patents granted (10,000)
Integrated circuit in the Yangtze River Delta	Chip design/manufacturing	3,200	1.5	18 %	8.2
Guangdong new energy vehicles	Vehicle/power battery	2,800	2.1	15 %	6.5
Industrial Internet in the Beijing-Tianjin-Hebei region	Intelligent equipment	1,900	1.2	19 %	5.1

The industrial clusters in China are accelerating the process of autonomous control over the industrial chain through collaborative innovation. The Yangtze River Delta semiconductor cluster has established a full-chain system covering "design-manufacturing-sealing and testing-materials." In 2024, SMIC and Shanghai Xinyang jointly broke through the 14-nanometer ArF photoresist technology; the Guangdong-Hong Kong-Macao new energy vehicle cluster has formed deep collaboration between "batteries and vehicles," with BYD's Blade Battery achieving a range exceeding 1,000 kilometers and reducing costs by 30 %, while GAC's super fast charging can achieve a 200-kilometer range in just 5 minutes. On the policy front, Zhejiang's "chain leader system" has driven a 45 % increase in revenue for the semiconductor cluster, and Guangdong's 20 billion yuan industry fund has helped Xiaopeng Auto achieve an autonomous driving penetration rate of 65 %. Significant progress has been made in key technology substitution: the localization rate of the C919 has increased to 75 %, Estun RV reducers have achieved a precision of ± 0.02 millimeters and a lifespan exceeding 30,000 hours, and the localization rate of industrial robots has risen from 5 % (in 2018) to 32 %. These practices demonstrate

that through the three-dimensional synergy of "chain-based clusters + policy empowerment + technological breakthroughs," China is effectively addressing critical bottlenecks and building an internationally competitive industrial ecosystem.

Table 9 – Comparison of domestic substitution rate of key industrial chains [28]

Industrial chain link	Replacement rate in 2018	Replacement rate in 2024	Representative enterprise/technology
High-end lithography machine	0 %	15 % (28 nm DUV)	Shanghai Microelectronics SSA800 series
Aerospace engine bearings	3 %	18 %	Wazhou Group high-speed rail bearings
Industrial software (CAD)	8 %	25 %	Zhongwang software All-in-One solution
Carbon fiber (T800 grade)	12 %	58 %	Zhongfu Shenyang Xining base

China's industrial chain upgrade is characterized by a three-dimensional development pattern of "chain leader leadership + specialized, refined, unique, and innovative breakthroughs + digital intelligence integration." Huawei, as the "chain leader" in the communication industry, has built an ecosystem covering 4,000 partners and 900 million devices through HarmonyOS; SMIC has led companies like Unisem to achieve domestic production of 28-nanometer etching machines, increasing the self-sufficiency rate of semiconductor equipment from 12 % to 38 %. Specialized, refined, unique, and innovative enterprises have made key technological breakthroughs: Shanghai Xinyang's ArF photoresist holds 35 % of the domestic market, Xi Zi collaborative robots have entered Tesla production lines, and AVIC Heavy Industry's 3D-printed components have helped reduce the weight of the C919 by 40 %. The industrial internet is accelerating the integration of two industries, with 45 national platforms connecting 80 million devices. Haier's COSMOPlat has improved the efficiency of Shenyang Machine Tool by 18 % and shortened delivery cycles by 25 %, with a digital contribution rate of 40 %. This "ecosystem leadership-technology breakthrough-digital empowerment" triple innovation path is driving China's manufacturing sector toward the higher end of the global value chain.

In the context of Sino-US confrontation, innovation in smart manufacturing scenarios is reshaping the competitive landscape from multiple dimensions. It enhances production efficiency and promotes the development of high-end industries, thereby strengthening China's industrial competitiveness and effectively countering US trade and technology containment.

Table 10 – Application results of industrial Internet platforms (typical cases in 2024) [10]

Platform name	service industry; service occupations	Corporate case studies	Key indicators improved	The extent of cost reduction
Kaos	Equipment manufacturing	Shenyang machine tool	OEE increased by 18 %	15 %
Tree root interconnection	construction machinery	Sany Heavy Industry	The fault warning accuracy is 95 %	20 %
Aliyun	electronic information	Hikvision	The development cycle is shortened by 30 %	22 %

By reducing tariff pressures and breaking through technological blockades, it plays a crucial role. Through promoting collaborative innovation across the supply chain [63] and nurturing local suppliers, it helps ensure supply chain autonomy and reduces risks associated with dependence on US supply chains, safeguarding industrial security. By exporting Chinese standards based on innovative practices and enhancing international cooperation to expand standard influence, it supports China in gaining a voice in global smart manufacturing standard-setting, challenging US dominance and driving the global smart manufacturing standards system toward greater fairness and diversity. This enables China to take the initiative in technological and industrial competition.

Innovations in service-oriented manufacturing models profoundly impact the Sino-US confrontation landscape by redefining industrial value chains, enhancing supply chain resilience, and vying for global industry discourse power. In terms of value creation, these innovations break down the traditional boundaries between manufacturing and services, boosting added value through product lifecycle management and personalized customization services, thereby strengthening Chinese companies' risk resistance capabilities in high-end manufacturing and services, and mitigating the impact of US

tariffs and technological blockades on traditional manufacturing [33]. Regarding supply chain security, service-oriented manufacturing models promote deep collaboration across the industry chain through data-driven service extensions, accelerating domestic substitution processes and reducing reliance on US supply chains. For example, remote operation and maintenance services based on industrial internet platforms enhance the collaborative response capabilities of the industrial chain and ensure the stability of key industries [64]. In global industrial competition, China leverages service-oriented manufacturing innovations to export its own standards and solutions, promoting the integration of "products + services" in international markets such as "Belt and Road," contesting the formulation of global service-oriented manufacturing rules, breaking the US's early-mover advantage in manufacturing services, and providing strategic support for gaining the upper hand in Sino-US confrontations and achieving high-quality industrial development.

In the context of Sino-US confrontation, the precise drip irrigation mechanism of industrial policy enhances China's international competitiveness in multiple ways. In the field of technological innovation, by focusing resources on key areas such as semiconductors and artificial intelligence, tax incentives and credit support are provided to R&D enterprises, precisely supporting corporate technological innovation, reducing reliance on foreign technology, and helping to break through in global tech competition. For the optimization and upgrading of industrial structure, emerging industries like new energy and intelligent manufacturing receive comprehensive support from policies and funding, promoting their rapid development; for traditional industries, guidance is given towards intelligent transformation, driving the entire industry towards higher-end levels and enhancing its position in global industrial division. From the perspective of ensuring supply chain stability, collaboration between upstream and downstream segments of the industrial chain is supported, facilitating the domestic production of critical components and improving supply chain resilience; the industrial support system is perfected, forming industrial clusters, and enhancing industrial synergy efficiency [55]. These measures make China more autonomous and resilient in the face of US technological blockades and trade

restrictions, positioning China more favorably in the global industrial landscape and boosting its international competitiveness.

In the context of Sino-U.S. conflict, China's breakthrough in international standard competition and its role transformation in the restructuring of global industrial chains can be explained from multiple dimensions of economic principles. According to the principle of economies of scale, China's vast domestic market provides a low-cost, high-efficiency foundation for industries such as 5G and new energy, giving them an advantage in technology research and development and application, thus enabling them to take the initiative in setting international standards; at the same time, based on the theory of technological innovation and spillover effects, the technological progress generated by R&D investment not only enhances corporate core competitiveness but also drives overall technological upgrades in the industry, further strengthening their influence over standards. In terms of the restructuring of the global industrial chain, with the dynamic changes in comparative advantages, China is gradually shifting from traditional labor-intensive industries to technology-and capital-intensive sectors, promoting the extension of industries into higher-value segments; meanwhile, the synergistic effects formed by industrial clusters [69], through resource sharing and technical exchanges, enhance the global competitiveness of these clusters, attracting cooperation among upstream and downstream enterprises in the industrial chain, thereby transforming China's role in the global industrial chain from a participant to a leader.

Table 11 – Comparison of key manufacturing indicators in China and the United States (2024) [6]

index	China	US	Gap analysis
Labor productivity in manufacturing	\$15,200 per person	\$38,500 per person	The level of automation is low, and high-end equipment is imported
R&d investment intensity	2.80 %	3.50 %	The proportion of basic research is low
Number of global TOP500 brands	45	198	Brand premium power is insufficient

China advances the modernization of its industrial system through systematic strategic measures to meet global competition, encompassing multi-dimensional

coordinated layouts: In consolidating advantageous industries, it enhances traditional industry efficiency and competitiveness through technological upgrades, strengthening industrial chains, and regional collaboration; in fostering new growth drivers, it focuses on cutting-edge technology research and development, promoting the clustering development of strategic emerging industries, and laying out future industries to seize development high ground; meanwhile, it deepens the integration of the digital economy with the real economy, both driving the cultivation of international competitive advantages in digital industries and leveraging industrial digitalization to empower the transformation of traditional industries; furthermore, it builds a high-quality and efficient service sector, promoting deep integration between services, manufacturing, and agriculture to improve overall supply quality; finally, by optimizing traditional infrastructure and deploying new infrastructure, it leverages the supporting and leading role of infrastructure in industrial development. These systemic measures form a synergy, helping China secure a favorable position in global industrial competition.

Table 12 – Comparison of institutional opening strategies between China and the United States (2024) [24]

dimension	China's path	The American path
Rule Focus	Digital economy, green standards and investment facilitation	Technology blockade, "friendship outsourcing" and value binding
Cooperation mechanism	RCEP, "Belt and Road", BRICS countries	IPEF, U.S.-European Trade and Technology Council (TTC)
Institutional output	Cross-border settlement of digital RMB and rules for China-Europe freight trains	Long-arm jurisdiction, hegemony of the dollar payment system

In 2023, China officially joined the Digital Economy Partnership Agreement (DEPA), taking the lead in piloting initiatives in areas such as cross-border data flow, AI ethics, and electronic invoicing. For instance, under the "data non-localization" clause, China allows fintech companies to conduct pilot projects for the "negative list of data outbound" in the Hainan Free Trade Zone. Through this mechanism, Alipay has achieved compliant cross-border payment data circulation with seven Southeast Asian countries, with transaction volumes reaching 85 billion yuan in 2024, reducing costs by 30 %.

China has demonstrated a transformation from being a rule-taker to a governance leader in the reform of global economic governance systems. In response to carbon tariffs from Europe and America, China's carbon market saw a trading volume of 520 million tons in 2024, and it has promoted the export of "Belt and Road" green standards, such as the Red Sea New City project in Saudi Arabia adopting Chinese photovoltaic standards to achieve a 12 % energy efficiency improvement.

Table 13 – Scale of digital economy in DEPA member States and progress of cooperation with China [69]

Country/region	Size of digital economy (2024, trillion US dollars)	China cooperation case
Singapore	0.78	Joint development of a "cross-border electronic invoice" system
Korea; Republic of Korea	1.25	Artificial intelligence patent cross-licensing mechanism
Chile	0.12	Pilot cross-border payment of digital RMB

In terms of institutional openness, China has made breakthroughs through CPTPP reforms: Baowu Group introduced strategic investors to achieve market-oriented transformation, and Shenzhen reduced the patent examination cycle for integrated circuits to six months. Regional cooperation mechanisms have shown significant innovation, with the RCEP framework driving China-Vietnamese industrial chain collaboration that boosted exports to Japan by \$42 billion (+28 %). The "Belt and Road" initiative has facilitated the joint output of Chinese railway standards, quality management systems, and technical talent (with 30,000 people trained at the Luban Workshops). Digital yuan has achieved cross-border real-time settlement through the mBridge project, potentially reducing currency mismatch risks by 18 % for "Belt and Road" countries. Currently, China leads the formulation of 650 international standards (accounting for 12 % globally), and supported by hard power in areas like new energy vehicles (35 % of global exports) and 5G (60 % of global share), it is promoting the internationalization of "Chinese solutions" in charging standards and 5G-Advanced protocols. In the future, it is necessary to break through the technical standards blockade imposed by developed countries (such

as the Wassenaar Arrangement) and address deep-seated issues of internal reform (such as the separation of functions in state-owned enterprises). This can be achieved through "mini-multilateral" pilots (like the RCEP Digital Economy Zone, where data flow increased by 210 %) and by building governance alliances with developing countries (such as the BRICS Green Technology Transfer Mechanism), to construct a more inclusive new international rule system.

3.3 Cultivating economic resilience in the face of normalization

The economic competition and cooperation between China and the United States are showing a trend of rebalancing, driven by factors such as the rapid enhancement of China's economic strength, industrial structure adjustment and upgrading, and changes in trade patterns. The rise of China's economy has steadily elevated its position in the global economy, intensifying competition with the U.S. in emerging industries, yet there remains room for cooperation along the industrial chain. Trade relations seek new balances through friction and negotiation, while China's active expansion into overseas markets is prompting both sides to reassess their relationship. In this context, the fundamental logic behind China and the U.S. "fighting over norms" lies in safeguarding national sovereignty and development interests, opposing the U.S.'s misuse of international economic norms for unreasonable restrictions.

Table 14 – Key indicators of economic interdependence between China and the US (2024)
[26]

field	China's dependence on the US	America's dependence on China
Export of goods	14.70 %	16.50 %
Cross-referencing of technology patents	28 %	32 %
The share of multinational companies' revenue	Huawei (18 %)	Apple (19 %)

Efforts are being made to promote the establishment of a fair and reasonable international economic order, changing existing unreasonable rules; and due to cultural and value differences between China and the U.S., China insists on norms that align with

its own philosophy, coordinating differences in understanding and application of these norms with the U.S.

By 2024, China's industrial chain layout around the world is truly diverse. In ASEAN, there are six industrial parks, mainly focusing on electronics and machinery, with local purchases accounting for 35 %. This not only serves ASEAN but also impacts the EU market; in Mexico, there are three industrial parks, primarily producing automotive parts, with local purchases making up 28 %, mainly affecting the North American market; in Central and Eastern Europe, there are two industrial parks, mainly engaged in photovoltaic and energy storage, with local purchases reaching up to 42 %, primarily impacting the European market. This demonstrates that China is strategically positioning itself based on the resources, markets, and industrial foundations of each region, gradually building a global industrial network to enhance the competitiveness and influence of our industries internationally.

Table 15 – Key indicators of China's overseas industrial chain layout (2024) [8]

area	Number of industrial parks	leading industry	Localization purchase rate	Radiation market
ASEAN	6	Electronics, machinery	30 %	Asean, EU
Mexico	3	auto parts; parts of a car	28 %	North America
Central and Eastern Europe	2	Photovoltaic, energy storage	42 %	Europe

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building a global industrial network to enhance the competitiveness and influence of our industries internationally.

The multidimensional impact exhibits an "asymmetric" characteristic: trade frictions manifest only as surface-level confrontations, while technological blockades constitute the middle-level game, and financial security involves deeper levels of competition. These three elements form a transmission loop through the "supply chain-innovation chain-finance chain." Despite facing pressure, China's economy has shown a trend of "resilient growth," with an average annual GDP growth rate of 5.1 % from 2018 to 2023, surpassing the global average of 2.8 %. However, the growth rate of total factor productivity declined from 1.5 % to 0.9 %, indicating that the transformation of growth drivers is not yet complete, and the traditional factor-driven model still requires further breakthroughs.

To address the increasingly routine confrontations, China's policy system has evolved from the "crisis response" phase to the "system reconstruction" phase, establishing a three-tier policy framework of "short-term hedging-mid-term transformation-long-term leadership." At the short-term hedging level, trade policies feature "market diversification + industrial chain backup": exports to ASEAN and the Middle East have grown at an average annual rate of 12.7 %, and 12 overseas economic and trade cooperation zones have been established in Mexico and Vietnam, achieving three major goals: "avoiding tariff barriers-closer to consumer markets-diversifying supply chain risks."

In terms of science and technology policy, the "Revealing the List and Appointing the Leader" system has been implemented, with 50 major projects established in fields such as photolithography machines and aviation engines. The proportion of "non-directed basic research" in central government science and technology investment has increased from 15 % to 30 %. At the same time, a rapid conversion channel for "technology breakthroughs – pilot testing – industrial application" has been established. The yield of SMIC's 14-nanometer chips rose from 35 % in 2019 to 95 % in 2023, fully demonstrating the effectiveness of institutional innovation.

It is worth noting that China's policy system has demonstrated its evolutionary capabilities in stress testing, experience accumulation, and institutional innovation. For instance, the "domestic substitution" experience generated to counter technological

blockades has been distilled into the theory of a "new national system," which has achieved paradigm shifts in areas such as lunar exploration and quantum computing. In the financial sector, macro-prudential policies designed to address capital flow shocks have, after being tested in practice, formed a three-dimensional framework of "macro-prudential + micro-regulation + market self-discipline," which has been incorporated into the *China Financial Stability Report* as an institutional arrangement. This ability to elevate practices transforms resistance into reform momentum; from 2018 to 2023, over 11 trillion yuan was added in tax cuts and fee reductions, and the number of market entities grew from 110 million to 170 million, reflecting the positive interaction between institutional flexibility and economic vitality.

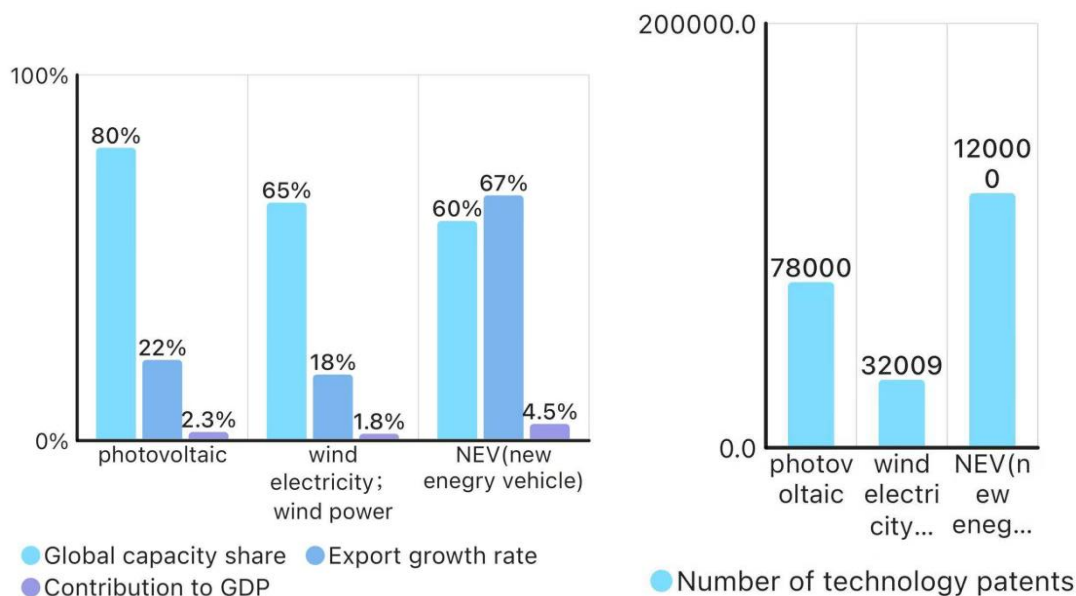


Figure 14 – Key indicators of China's green economy (2024) [47]

In 2024, China's green economy is set to shine with numerous highlights. The advantages of photovoltaic, wind power, and new energy vehicles in global production capacity are evident, reaching 80 %, 65 %, and 60 % respectively. In terms of technological innovation, new energy vehicle patents lead at 120,000, followed by 78,000 for photovoltaics and 32,000 for wind power. In export growth, new energy vehicles take the lead at 67 %, followed by 22 % for photovoltaics and 18 % for wind power. In terms of GDP contribution, new energy vehicles top the list at 4.50 %, followed by 2.30 % for

photovoltaics and 1.80 % for wind power. It is clear that China's green economy excels in scale, innovation, exports, and economic contribution, holding a significant position and promising future in the global green economy.

Conclusion

The competition between China and the United States is an example of power shifts among major countries during the ebb of globalization. This competition has far-reaching impacts on China's economy, extending beyond mere trade frictions to encompass broader challenges such as technological blockades, financial maneuvers, and rule-based competition. From a trade perspective, starting in 2018, the U.S. imposed tariffs ranging from 10 % to 25 % on approximately \$250 billion worth of Chinese goods. This led to China's exports to the U.S., which peaked at \$505.6 billion in 2017, falling to \$404.3 billion in 2023, a decline of 20.1 %. Particularly hard-hit were high-end manufactured products, such as machinery and electronics. However, it is noteworthy that China offset about 63 % of its export losses through trade realignment within the RCEP region (with exports to ASEAN increasing to 22.3 % in 2023) and by expanding its domestic market (with final consumption expenditure accounting for 65.4 % of GDP). This demonstrates the resilience of China's economic system.

In terms of technological competition, the United States has imposed technical restrictions on over 1,300 Chinese companies, which has slightly reduced China's reliance on chips from 79.6 % in 2018 to 72.1 % in 2023. However, we still lag behind others in chip manufacturing technology below 7 nanometers. This pressure has forced China to increase its R&D investment, rising from 2.14 % in 2018 to 2.64 % in 2023. The proportion of funding for basic research by the National Natural Science Foundation also increased from 45 % to 58 %. Huawei's "Hongmeng Ecosystem" now has more than 5 million developers, indicating that our innovation system is shifting from application-focused to foundation-focused. However, in the field of artificial intelligence, U.S. export restrictions on GPU chips have widened China's computing capability gap to 32 %, suggesting that we are still constrained in some critical areas, a problem that cannot be resolved in the short term.

In the financial sector, the complexity and risk of competition are more pronounced. The United States has exploited the conflict in the audit supervision of Chinese companies listed overseas, leading to over 120 Chinese enterprises being forced to delist, which in

turn reduced their overseas financing scale by 41 %. However, during this period, net inflows through the Shanghai-Hong Kong and Shenzhen-Hong Kong Stock Connect reached 1.2 trillion yuan, and the amount raised on the domestic STAR Market increased by 230 %, reflecting the capital market's resilience. The internationalization of the renminbi has accelerated, with the number of countries covered by the CIPS system increasing from 97 in 2018 to 196 in 2023, and the proportion of oil settlements in renminbi exceeding 18 %, preliminarily forming a payment system parallel to the US dollar system. However, it is important to note that the inverted yield spread between US and Chinese ten-year government bonds (-1.25 percentage points) has intensified the pressure on capital outflows, with foreign exchange reserves declining by 9.3 % in 2023 compared to their peak, highlighting the urgency of strengthening financial security defenses.

The core goal of the medium-to long-term transformation is to build a new development pattern, with the key being to address the bottlenecks in the "production – distribution – circulation – consumption" cycle within the domestic market. Through the linkage mechanism of the three-tier distribution system, the proportion of middle-income groups increased from 29 % in 2018 to 38 % in 2023, and the household consumption rate rose from 39 % to 45 %. Meanwhile, emerging industries such as smart home appliances and new energy vehicles have seen an average annual growth rate of 18 %. In terms of modernizing the industrial system, the implementation of the "chain leader system" has promoted the development of five national advanced manufacturing clusters. The integrated circuit industry along the G60 Science and Technology Corridor in the Yangtze River Delta has exceeded 1.2 trillion yuan, forming a vertical division of labor characterized by "R&D in Shanghai, manufacturing in Suzhou, and packaging in Wuxi." Regarding institutional openness, China has completed the alignment with DEPA's non-discriminatory provisions for digital products and proposed 12 "Chinese solutions" in areas such as labor standards and environmental rules under the CPTPP, gradually transforming from a recipient of international rules to an active participant.

Ultimately, the confrontation between China and the United States is essentially a contest of two modernization models, whose economic impact has transcended bilateral

boundaries to become a key factor in reshaping the global economic order. From a theoretical perspective, the "comparative advantage" framework in traditional international trade theory struggles to explain current technological blockades, while the "strategic trade policy" theory, which overlooks the asymmetry of power dynamics among major powers, also needs revision. This study proposes a "power-technology-institution" triangular analysis model, revealing that during the ebb of globalization, technological superiority is no longer solely determined by market mechanisms but is deeply embedded in the power structures of strategic competition among major powers, with institutional rules serving as the vehicle for the export of technical standards. This model offers a new perspective on understanding the interplay mechanism of "chip regulation – rule game – financial weaponization."

Looking ahead, the confrontation will exhibit characteristics of "high intensity, low intensity, and long duration." China's economy needs to cultivate resilience on three levels: First, technological autonomy must break through the path of "gradual catch-up," implementing "asymmetric innovation" in cutting-edge fields such as quantum communication and brain-computer interfaces. Relying on a new national system, it should establish an ultra-cyclical system from "basic research – applied research – industry transformation," aiming to achieve paradigm shifts in 5-8 key areas by 2030; Second, financial security requires building a "dual-track" monetary system. While expanding the cross-border use of the renminbi, it should accelerate the integration of digital yuan (DCEP) with blockchain technology, establishing a new international payment network based on "technical trust," reducing reliance on traditional financial infrastructure; Finally, global governance participation must shift from "issue response" to "agenda setting." In areas like green and low-carbon development and the digital economy, China should export "Chinese standards," pushing for WTO reforms that include developing countries' demands for digital sovereignty and cross-border data flows, to build a more inclusive international economic order.

From a long-term historical perspective, the current confrontation actually marks China's transition from "catching up within the system" to "systemic rise." Looking back at Britain's technological embargo on the United States in the 19th century (the export ban

on textile machinery) and the semiconductor competition between the U.S. and Japan in the 1980s, these events failed to prevent latecomer countries from upgrading their industries. The key lies in whether external pressure can be transformed into a driving force for internal change. The "resilience" currently displayed by the Chinese economy stems from over 40 years of reform and opening up, which have accumulated industrial depth (covering 41 major industrial categories), a massive market size (with retail sales exceeding 40 trillion yuan), and institutional flexibility (the construction of a unified national market, effectively breaking down regional barriers). These factors collectively form the "strategic foundation" for long-term competition.

Standing at a new historical juncture, the real challenge facing China's economy is not about coping with short-term shocks, but whether it can achieve a fundamental transformation in its development model – – shifting from factor-driven to innovation-driven growth, from solely pursuing efficiency to balancing social equity, and from integrating into the existing system to leading global governance. If this transition can be successfully achieved, China will not only break through the economic dilemma of the "Thucydides Trap," but also contribute a new paradigm of "peaceful rise" to human civilization. From this perspective, the ultimate answer to the China-U.S. confrontation may lie in whether China's economy can find that dynamic balance point of the "golden ratio" between openness and autonomy, competition and cooperation, efficiency and equity.

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