Essential Characteristics and Pathways for Creating a Modern Industrial System

Sheng Chaoxun*
Chinese Academy of Macroeconomic Research, Beijing, China

Abstract: *Modern nations are built upon the material and technological foundation of the modern industrial system. It is important to identify the characteristics of intelligent, environmentally sustainable, and integrated industrial development, in addition to security, competitiveness, and integrity. Policymakers should be clear-eyed about what the industrial system means and entails. Taking into account the factors that influence industrial integrity, competitiveness, and security, it is recommended that the government promote industrial security via industrial restructuring, facilitate the flow of "technology, industry, and finance," endeavor to establish world-class industrial clusters, and construct a modern industrial system backed by the real economy in order to bolster the stability, security, and impetus of development.*

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The Report to the 20th CPC National Congress advocated the "construction of a contemporary industrial system." During its second study session, the Politburo of the 20th CPC Central Committee emphasized: "We should continue to prioritize the development of the real economy" and "construct an independent, secure, dependable, and competitive modern industrial system."[1] During its first session, the Central Commission for Financial and Economic Affairs (CCFEA) under the 20th CPC Central Committee recommended that "efforts be made to develop a comprehensive, competitive, and secure modern industrial system while advancing intelligent, green, and integrated industrial operations."[2] This signifies the determination of the CPC Central Committee with Comrade Xi Jinping as the core to pursue the second centennial goal and maintain a balance between security and development. The establishment of a modern industrial system is a prerequisite for the modernization of China to act as a foundation for a new paradigm of development, and prevail in future international competition. We must be mindful of the importance of accelerating the development of a modern industrial system, identifying its key principles and requirements, and charting a clear path forward in the context of turbulent changes in today's world while envisioning the rejuvenation of the Chinese nation (Zheng, 2023).

1. Requirements for Creating a Modern Industrial System

1.1 Industrial System for the Modernization Drive

The 20th CPC National Congress introduced the concept of an "industrial system for the

* CONTACT: Sheng Chaoxu, email: shengcx@amr.gov.cn.
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[1] "Accelerate the Building of a New Development Pattern and to Make Development more Secure," *People's Daily*, February 2, 2023, page 1.
[2] Han Wenxiu, "Basic Requirements and Key Tasks for Accelerating the Construction of a Modern Industrial System," *People's Daily*, June 1, 2023, page 9.

modernization drive," but research into the modern industrial system is not new. Comparable notions were expressed in the Reports to the 17th and 18th CPC National Congresses, including "constructing a new system for modern industrial development" and "developing a modern industrial system." The reference to an industrial system for the modernization drive is similar to the earlier notion of the "modern industrial system" in terms of historical evolution, practical rationale, and policy targets.

Both terms emphasize the progress of an industrial system. The term modern industrial system refers to industrial competition and level of development, and is the antithesis of industrial development that is disorganized, fragmented, erratic, low-level, and lacking in distinctiveness. The Report to the 17th CPC National Congress, in response to challenges in China's economic structure and shifts in the international division of labor, advocated for the establishment of a modern industrial system as a means of improving China's economic structure and promoting systematic industrial development. This recommendation was new and unprecedented. With the objective of improving China's economic structure, the Report to the 20th CPC National Congress outlined a plan to "construct an industrial system for the modernization drive": Fortify leadership in advantageous industries, establish the digital economy, develop a new service sector system characterized by superior quality and efficiency, encourage the coordinated and integrated growth of strategic emerging industries, and construct a modern infrastructure system.

Both terms emphasize the importance of modernizing the industrial system. Prioritized in the *Outline of the 12th Five-Year Plan* were "substantial job creation, advanced technology, clean and secure development, and high value addition." The *Outline of the 13th Five-Year Plan* emphasized "environmental friendliness, high-quality services, and close collaboration." Both imposed additional requirements on a modern industrial system, that it is environmentally sustainable, technologically sophisticated, and efficient. The notion of an "industrial system for the modernization drive" was introduced in the Report to the 20th CPC National Congress. This document underscored the importance of developing advanced, intelligent, and environmentally sustainable manufacturing processes, as well as establishing an effective and streamlined distribution network. The first session of the Central Commission for Financial and Economic Affairs under the 20th CPC Central Committee emphasized the importance of integrating global innovation factors and fostering intelligent, environmentally sustainable, and integrated industrial development,[3] in this way, creating a knowledge and technology-driven industrial system characterized by innovation and value addition.

In addition, both terms focus on problem solving and the setting of strategic objectives. As stated at the 17th CPC National Congress, it is necessary to build a modern industrial system that integrates informatization and industrialization in order to address gaps in the integration in the industrial sector, as well as improve the quality of development, add industrial value and enhance competitiveness, strengthen equipment manufacturing, and boost productivity. The Report to the 19th CPC National Congress provided a distinctive problem-oriented approach to building an industrial system characterized by coordinated development of the real economy, innovation, modern finance, and human resources. The objective was to tackle challenges such as the unchecked expansion of the virtual economy and the contradictions of innovation, finance, and human resources, balancing them with the needs of the real economy. The Report to the 20th CPC National Congress advocated the establishment of a "modern industrial system" that prioritized security, competitiveness, and integrity to establish a modern industrial system that should be independent, secure, dependable, and competitive in order to facilitate the realization of the modernization of China and the establishment of a new paradigm for development, among other strategic priorities.

From a "modern industrial system" to an "industrial system for the modernization drive," as the policy statements advocate, China's industrial system is to be modernized to undergo these significant

[3] Han Wenxiu, "Basic Requirements and Key Tasks for Accelerating the Construction of a Modern Industrial System," *People's Daily*, June 1, 2023, page 9.

changes as follows:

First, the industrial structure must be transformed. We should take advantage of opportunities presented by shifts in the global industrial landscape and establish a modern industrial system that expands into new territories and is successful in new areas. Instead of relying on established industrial sectors, which make up a substantial portion of the economy at the moment, it is important to cultivate emerging industries that will become the driving forces of economic growth.

Secondly, the trajectory of development must be adjusted. The modern industrial system requires the traditional factor-driven path of industrial development to be transformed into an innovation-driven one. Technological, institutional, and business mode innovations should be fostered in order to bolster factor productivity, facilitate the circulation of "technology, industry, and finance," enhance the competitiveness of China's economy, amplify development momentum, and advance innovation-driven development that cultivates technological, intellectual, and talent resources.

Third, the modern industrial system requires effective linkages and coordination between innovation, modern finance, human resources, data, and other high-end factors. It also requires the provision of specialized services in accordance with the needs of industrial development at various stages, categories, and situations. The outcome is an organizational system and industrial paradigm that facilitates circulation and enhances the efficiency of factor allocation. This will enable the nation to emerge as a prominent global center for the distribution of financial, technological, industrial, and data resources.

The phrase "industrial system for the modernization drive" has the following implications: First, it focuses on the process of modernizing the industrial system. Second, it reflects a broader concept in that the industrial system's progress toward modernization includes not only industrial progress and system development, but also infrastructure modernization, supportive factors, and even industrial development, urbanization, informatization, digitalization, and agricultural modernization. Similarly, industrialization encompasses more than just industrial development. Third, it demonstrates a stronger link between Chinese modernization and the establishment of a modern economic system. With the theme of Chinese modernization in mind, the Report to the 20th CPC National Congress advocated "modernizing the industrial system."

Table 1: Descriptions of the Modern Industrial System in China's Key Policy Documents

Time	Source	Description
October 2007	*Report to the 17th CPC National Congress*	Develop a modern industrial system, integrate informatization and industrialization, enhance industrial competitiveness, strengthen equipment manufacturing, and phase out backward capacities
March 2011	*Outline of the 12th Five-Year Plan for National Economic and Social Development of the People's Republic of China*	Develop a modern industrial system with a reasonable structure, advanced technology, clean and safe operations, high value addition, and strong job creation
November 2012	*Report to the 18th CPC National Congress*	Strive to create a new system for modern industrial development
March 2016	13th Five-Year Plan for National Economic and Social Development of the People's Republic of China	Expedite the development of a new modern industrial system characterized by ingenuity, good quality of services, close collaboration, and eco-friendliness
October 2017	*Report to the 19th CPC National Congress*	Strive to develop an industrial system for the coordinated development of the real economy, technology innovation, modern finance, and human resources.
January 30, 2018	Third Collective Study Session of the Politburo of the 19th CPC Central Committee	Construct an industrial system led by innovation and coordinated development

Table 1 Continued

Time	Source	Description
March 2021	*Outline of the 14th Five-Year Plan for National Economic and Social Development and Vision 2035 of the People's Republic of China*	Keep the focus of economic development on the real economy, and create a modern industrial system for the coordinated development of the real economy, technology innovation, modern finance, and human resources.
October 2022	*Report to the 20th CPC National Congress*	Modernize the industrial system
December 2022	Central Economic Work Conference	Expedite the development of a modern industrial system
January 2023	Second Collective Study Session of the Politburo of the 20th CPC Central Committee	Develop an independent, secure, reliable and competitive modern industrial system
May 2023	First session of the Central Commission for Financial and Economic Affairs under the 20th CPC Central Committee	Promote intelligent, green and integrated industrial development, and build a complete, advanced and secure modern industrial system.

Source: Compiled based on relevant conference documents.

1.2 Characteristics and Requirements of the Modern Industrial System

The characteristics of the modern industrial system have been thoroughly explored by academics. The modern industrial system, according to Sheng (2019a), is defined by innovation, factor coordination, complete value chains, and competitiveness. Efforts should be made to improve quality, efficiency, dynamism, total factor productivity (TFP), and core industrial competitiveness through institutional processes, factor cultivation, business entities, and industry growth. Huang and Sheng (2023) elaborated the implications of the modern industrial system by considering the two aspects of horizontal industrial composition and vertical industrial capabilities. They believe that the modern industrial system, which includes advanced manufacturing, modern services, modern agriculture, and modern infrastructure, should be led by strategic emerging industries. The modern industrial system is defined by the growing sophistication of the industrial foundation, a rational industrial structure, a modern industrial chain, and integration of the digital and real economies. As such, the modern industrial system should be fueled by innovation, integration, structural improvement, green and intelligent operations, security and self-sufficiency, a high level of openness, competitiveness, and a desirable economic return. Liu (2023) asserts that the modern industrial system can be defined not only by the degree of industrial performance, effective manufacturing-marketing linkages, the proper ratio of industries, the degree of integration between industrial sectors, and the completeness of infrastructure, but also by its role in advancing modernization, innovation leadership, security, resilience, openness, competitiveness, and the sustainability of development.[4]

The first session of the Central Commission for Financial and Economic Affairs under the 20th CPC Central Committee pledged to "promote intelligent, eco-friendly, and integrated industrial operations, and build a complete, advanced, and secure modern industrial system", which is an insightful summary of the modern industrial system's characteristics and requirements.

Intelligent, eco-friendly, and integrated operations are characteristics of industrial sophistication around the world. It is also an important step toward developing a modern industrial system.

First and foremost, intelligent operations are an ongoing theme in human industrial and technological revolutions. Since the mechanization age, electrification, informatization, digitalization, and the AI-based revolution have accelerated industrial automation and intelligence. This has revolutionized people's ways of life and work, boosted productivity, and given leading nations a global

[4] Liu Zhenzhong, "Understanding the Modern Industrial System," *Economic Daily*, February 14, 2023, page 10.

industrial competitive edge. China's success or failure in global competition, as well as its position in the global division of labor, are dependent on its ability to make the first move in the global transition to intelligence. In order to build a modern industrial system, we must seize the opportunities that come with a new round of technological revolution and industrial change, race to achieve breakthroughs in new technologies such as artificial intelligence and next-generation information technology, integrate smart technology applications with social and economic development, and strive to take the strategic high ground of global industrial intelligenization.

Second, eco-friendliness is critical for the harmonious relationship of man and nature. Humanity's acquisition of natural resources and energy consumption has both increased in tandem with rising global industrialization. Hence, the human-nature relationship has become more intense, as indicated by more frequent extreme weather events and climate change. The Earth is the only habitat available for the human race. The entire world must work together to achieve harmony between man and nature, to respect and protect nature, to encourage green industrial development, and to revamp the energy and industrial structures in ways that promote sustainable growth. Green technology and green rules have become focal points of a new wave of global industrial competition. Countries must develop green technologies and green products in order to establish new drivers of the green economy.

Finally, integration is a common element of a modern industrial system and a crucial channel for its actualization. Industry is made up of many subsectors, and no industrial growth can be achieved without the material and technological assistance of a variety of sectors. For example, the high-quality development of the IT industry is dependent on advances in equipment and material technology. Chips and big data are critical for advances in biotechnology. Integration of sophisticated manufacturing and modern services, as well as digital and real economies, is an essential part of China's manufacturing revolution and upgrading. Deep integration of primary, secondary, and tertiary industries, as well as the integration of ground-breaking technologies in relevant fields, is critical for developing new technologies, products, and business models.

Integrity, sophistication, and security are fundamental parts of the modern industrial system. Integrity refers to the completeness of the industrial system and sectors and is essential for industrial security. China should continue to strengthen and promote its industrial integrity. Sophistication refers to industry's global leadership in technology, structure, standardization, infrastructure, processes, methodologies, and concepts. The level of sophistication is a key indication of the current industrial system's cutting-edge nature. Increasing sophistication is an important way for industries to transition and upgrade and is a path to competitiveness and development. It is essential for the creation of new competitive advantages. Without sophistication, the country will be trapped in low-value operations or suffer security issues with chokepoint technology. We must improve industrial development through innovation by focusing on technology, talent, and creativity. Security refers to an industrial system's self-protection, risk resilience, and self-restoration. Balancing development and security is a prerequisite for constructing a modern industrial system. Security, integrity, and sophistication are interconnected. There can be no development without security, and security cannot exist without development. Previously, we prioritized cost and efficiency in industrial development. However, without security, integrity and sophistication will suffer and be weakened. Security may come at the expense of cost and efficiency in the short run. Yet it is beneficial to the establishment of new industrial strengths in terms of accomplishing integrity, sophistication, and security in the long run. This will encourage industries in countries and regions that lack a competitive advantage in one or more of those aspects to relocate to China, strengthening our overall competitiveness.

Integrity, sophistication, and security are prerequisites for developing a modern industrial system. The three elements are interconnected and complementary. A comprehensive approach is necessary to make coordinated progress on various fronts.

2. Progress and Problems in China's Development of a Modern Industrial System

2.1 Progress and Achievements of China's Development of a Modern Industrial System

2.1.1 China boasts the most complete industrial system in the world with strong supporting capabilities

China has made significant efforts to build a modern industrial system based on the real economy, develop advanced manufacturing, maintain a stable manufacturing proportion of the economy, and encourage steady manufacturing growth. China's manufacturing value-added reached 33.52 trillion yuan by 2022, accounting for 27.7% of the GDP, and China's share of global manufacturing activity rose from roughly 20% in 2012 to around 30% by 2022[5]. Since 2010, China has ranked first in the world for 13 years in a row, outpacing the combined production capacities of the world's second and third largest manufacturing nations. In comparison to the global manufacturing value-added, which accounts for 16.5% of the global GDP, China's manufacturing capacity has far outstripped the global average. China maintains the highest level of industrial system integrity globally, encompassing broad, medium, and small categories. It is the only country that has all of the industrial sectors included in the UN industry classification. It leads the world in the production of more than 40% of 500 important industrial products. It produces more than half of the world's crude steel, cement, electrolytic aluminum, flat-panel glass, and industrial robots, as well as more than 60% of new energy cars, household appliances, microcomputers, and chemical fiber products, and more than 70% of lithium batteries, solar cells, and mobile phones. Without question, China is a global manufacturing powerhouse, with a variety of industrial sectors, competitive product manufacturing capability, an adequate infrastructure, comprehensive industrial support capability, rapid product commercialization, and considerable cost and efficiency advantages.

2.1.2 Building an advanced industrial system and accelerating intelligent and green operations

China's emerging industries have flourished, as shown by the country's industrial structure. High-tech manufacturing and equipment manufacturing accounted for 15.5% and 31.8% of value-added from large industrial enterprises in 2022, respectively, up 6.1 and 3.8 percentage points from 2012. By 2022, China had some 400,000 high-tech enterprises, up from 390,000 in 2012, as well as 500,000 small and medium-sized tech firms, and 762 companies had joined the global top 2,500 enterprises in terms of R&D spending. Nearly 12,000 "little giant" firms and over 70,000 small and medium-sized specialized enterprises delivering novel goods have been nurtured in China.[6] China's manufacturing industry has become more inventive in terms of technology, and now leads the world in third-generation nuclear power, 5G commercialization, supercomputing, high-speed rail, and new energy vehicles. It is nearing completion of a transformation from a follower to a parallel runner and even forerunner in certain fields. Significant progress has been made in the creation of smart factories. In China, 110 plants meet globally advanced levels of smart manufacturing. China has built around 2,100 digital workshops and smart factories[7], as well as 50 beacon factories, accounting for 38% of the world's total[8]. China's industrial robot density has expanded 15-fold to 392 units per 10,000 workers, representing a significant increase in the penetration of industrial robots. The advent of smart manufacturing system integration solution providers with regional and industry prominence has boosted manufacturing efficiency, reinforcing

[5] Cong Liang, "Making Solid Efforts to Develop a Modern Industrial System with the Real Economy as the Backbone," *Economic Daily*, June 7, 2023, page 1.

[6] Wang Zheng, " In 2022, China's Total Industrial Added Value Exceeded 40 Trillion Yuan, and the Scale of Manufacturing Ranked First in the World for 13 Consecutive Years," *People's Daily*, March 18th, 2023.

[7] The Ministry of Industry and Information Technology, "China Has Built over 2,100 Digital Workshops and Smart Factories," https://www.cnii.com.cn/rmydb/202303/t20230301_450779.html.

[8] "China's 'Beacon Factories' Increased to 50, Continuing to Rank First in the World," https://baijiahao.baidu.com/s?id=1754981634641358959&wfr=spider&for=pc.

China's global leadership in the scope and sophistication of smart manufacturing applications. Green and low-carbon circular development has made steady progress, as indicated by the establishment of green firms and campuses, resulting in an increase in the supply of green products as well as the development of green supply chains. Rapid progress has been made in manufacturing-service integration, as well as explorations for new business modes, paradigms, and paths for the development of manufacturing and services. Manufacturing services such as R&D outsourcing, supply chain management, flexible manufacturing, and full-lifecycle management, as well as producer services, have seen steady advancements. The high-quality development of the service sector has made steady progress.

2.1.3 Increasing the level and support of industrial security

China has worked hard to strengthen its industrial basis while also improving the iteration and application of technological discoveries. It has fostered the development of the supply chain ecosystem in places such as Zhuzhou, Hangzhou, Wuhan, Chengdu, Ningde, Weifang, Nantong, Hefei, Guangzhou, Shenzhen, Baotou, and Qiqihaer. These supply chain ecosystems are linked, coordinated, and led by dominant supply chain firms, with the goal of increasing supply chain self-reliance. The construction of high-quality farms has made steady progress. Agri-technology is a growing contributor to agricultural output growth, resulting in major gains in agricultural yield and the mechanization of facility agriculture. China's grain output has topped 650 billion kg for eight years in a row, with a per capita level greatly exceeding the global average. The nation has achieved basic green self-sufficiency and absolute food supply security. The country has steadily improved the structure of its coal output, accelerated the development of coal, electric power, oil and gas production, storage, and distribution systems, and greatly accelerated the construction of oil and gas infrastructure. Steady progress has been made in essential oil and gas supply capacity, strategic energy import corridors, and energy infrastructure interconnectivity. The assurance of strategic mineral resources has increased significantly. The Ministry of Natural Resources has conducted a fresh round of mineral resource searches in partnership with other ministerial agencies in order to increase the inventory of important mineral resources such as lithium, cobalt, and nickel.

2.2 Problems and Challenges

2.2.1 Challenges to industrial system integrity

First, in the context of economic globalization, industrial relocation can help to optimize resource allocation and improve overall welfare. However, for geopolitical reasons, some countries are reshoring, near-shoring, or friend-shoring supply chains, raising the possibility of segmentation in the global industrial system. Some supply chains have moved elsewhere, compromising the integrity of the industrial system. Another issue is the increasing cost of finance. Global supply chain rearrangement and reshoring have increased competition and manufacturing costs. As a result, both the operating rate and the profit margin have decreased, creating severe challenges and uncertainties for many small and medium-sized businesses. Due to rising finance costs and decreasing accessibility, a significant amount of capital in the financial system is not being used due to a lack of a suitable return and outlet. Some loss-making sectors are expected to see capital and operating entities leave, threatening the integrity of the industrial system. Third, some communities have taken a one-size-fits-all approach to traditional sectors like steel foundry and dyeing, resulting in supply chain gaps, hurting the integrity of the industrial system.

2.2.2 Challenges to maintaining and increasing industrial sophistication

First, there have been challenges to acquiring advanced technology. The cost for China to acquire new technologies has increased as the spillover effect of developed economies has decreased. Due

to long-term strategic considerations, businesses have increased R&D spending, making company financial costs greater in the short run. Increasing technological autonomy and self-sufficiency requires more investments of capital over the long term, as well as a more robust innovation policy. Second, coordination issues hamper eco-friendly and smart building upgrades. Numerous small and medium-sized enterprises (SMEs) that are distributed across China's manufacturing industry's regions and sectors encounter various obstacles in pursuing green transition. There is a considerable degree of disparity in development across firms of various sizes and geographies. Most large corporations have made significant yet ineffective digital and intelligent investments. For some SMEs, whether they accept change or not is critical to their existence. Some communities have engaged in low-level repetitious construction, wasting resources and creating impediments to increased sophistication of the industrial system. Third, maintaining a high degree of sophistication in the industrial system requires coordinated efforts on both the supply and demand sides to bring about coordinated upgrades driven by both demand and supply. However, global market expansion and upgrade have been slower than anticipated. The high-end market and high-end demand, in particular, have played a diminishing role in driving the upgrading of the industry. The production of fewer sensational products, which may otherwise increase consumer demand, has reduced the rate of increased industrial sophistication. The underwhelming global economic recovery also has had an impact on employment and income, affecting consumption and industrial upgrading.

2.2.3 Industrial security risks needing attention

First, there is the security risk of choke points, such as supply disruptions of essential technologies, products, raw materials, and equipment, and the lack of energy security. Second, supply chain security risks include potential problems in the coordination of material and freight transportation, as well as coordination between innovation chains, supply chains, capital chains, and talent chains, and operational inefficiencies. Third, there is the risk of encountering barriers to improving security capabilities, such as re-engineering and upgrading industrial development culture, design concept, R&D, manufacturing, logistics, sales, and market systems, as well as potential challenges to industrial system restructuring.

3. Key Pathways for Constructing the Modern Industrial System

The modern industrial system is essential to establish a new development paradigm, attain high-quality development, and further Chinese-style modernization. It is critical to identify the direction of industrial restructuring, strengthen the foundation of industrial security, facilitate financial circulation for tech industries, and accelerate the development of world-class industrial clusters in order to create a modern industrial system supported by the real economy and improve the security, stability, and initiative of development.

3.1 Focusing on Industrial Restructuring

General Secretary Xi Jinping underlined the need to promote industrial restructuring and expedite the development of strategic emerging industries, high-tech sectors, and modern services (Xi, 2023). As shown by the industrial development journeys of major developed countries and China's eastern region, adjustment of the industrial structure in accordance with global industrial development trends is critical in order to upgrade the industrial system, promote economic growth, and increase competitiveness. The following priorities merit our attention. First, a new pillar strategy should be implemented. The government should encourage the development of key industries, as well as high-tech industries and modern services, in order to build new pillars for the industrial system and cultivate fresh vitality. Priority should be given to developing new energy and intelligent connected vehicles, high-end equipment, next-generation information technology, eco-friendliness, AI and large language model,

biomedicine, and new energy and new materials. These technologies, products, and applications should be implemented in order to promote the integrated growth of strategic emerging sectors.

Second, a new track approach should be taken. The current wave of technological revolution and industrial change should be taken advantage of by focusing on areas such as artificial intelligence, quantum information, synthetic biology, deep-sea and airspace development, genetics technology, and future energy, among other frontiers and directions of technology change. The Future Industrial Incubation and Acceleration Program[9] should be implemented, the supply of talent, R&D, supporting industries, and new infrastructure should be increased, a network of future technology research academies and product development zones should be created, and demonstrative technology applications and cross-sectoral industrial integration should be initiated to speed up the commercialization of technologies, explore new domains, and triumph in new arenas.

Third, conventional industries which need to be upgraded more rapidly should not be treated in a one-size-fits-all manner by policymakers. Instead, the renovation and upgrading of old industries should be encouraged in order to preserve the industrial system's integrity, diversity, and systematic nature. Special programs to improve core manufacturing competitiveness and technology, boost policy support and inclusivity, encourage SMEs to embrace modern technology and equipment, and promote product commercialization should continue to be conducted. Quality improvement programs, such as the Chinese Brand Day event, should be carried out in order to boost manufacturing products, enhance quality, and develop brands. The digital economy should help the real economy by increasing energy efficiency, lowering carbon emissions in essential industries, and hastening the transition to green and low-carbon manufacturing. Modern services should be integrated with manufacturing, and producer services including R&D design, modern finance, accounting and audit, conferences and exhibitions, high-end commercial services, and modern logistics should be developed. It is also critical to develop consumer services such as catering, hotels, senior care, health and wellness, culture and creativity, travel and leisure, and shopping and entertainment, as well as to establish a new system of high-quality and efficient services.

3.2 Bolstering the Foundation of Industrial Security

The modern industrial system is the basis of China's modernization. Industrial security is a vital aspect of national security. In such a situation that the impacts of various "black swan" and "grey rhino" events, the complex international environment and the restructuring of the global value chain are adding together to the complication, it is important to strike a balance between development and security, to prioritize industrial security, and to aim for independent, secure, and efficient supply chains. The goal is to promote food security and reinforce the security of modern industrial development. The first objective is to improve the sophistication of the industrial system and modernize supply chains. Efforts should be made to solve the impediments to improving industrial capabilities and modernizing supply chains, which include basic parts, basic components, basic software, basic processes, and basic industrial technologies. Long-term support should be given to research in essential areas and processes of the industrial chain, the evaluation of basic research outcomes should be improved, and firms should be provided with tax incentives to boost R&D spending. The iteration and application of important innovation breakthroughs should be increased.[10] To develop more innovative supply chains with higher value-added and greater safety and security, the government should implement policies that complement, extend, upgrade, and establish value chains for underdeveloped, advantageous, traditional, and emerging

[9] "Outline of the 14th Five-Year Plan for Economic and Social Development (2021–2025) and Long-Range Objectives through the Year 2035 of the People's Republic of China."

[10] Huang Qunhui, "Constructing a Complete and Advanced Modern Industrial System," *The Chinese People's Political Consultative Conference Journal*, July 13, 2023, page 3.

industries (Ni and Tian, 2021).

Second, the supply of mineral resources should be increased. An inventory of critical mineral resources should be created, a national strategy for critical mineral resources should be developed, and central SOEs in the field of mineral resources should be encouraged to engage in global partnerships for assessment of the critical mineral resources listed in the inventory; greater efforts should be made to identify domestically located mineral resources, and a system by which critical mineral resources could be managed should be created for business ecosystems and complete value chains. A system for mineral resource recovery and recycling should be created, as well as platforms for the circular economy and recycling. The mineral resource reserve system and transaction platform should be improved, focusing on mineral resource pricing power.

Third, the level of energy security should be raised. The energy revolution should be used to develop wind power, photovoltaic and other clean energy sources, increase domestic oil and gas exploration and development, and promote the complementarity of various energy sources to create an energy landscape characterized by structural optimization, clean and efficient operations, and secure and stable development.

Fourth, food security should be ensured. Provinces should conduct overall planning and execute product-specific production policies based on their individual capabilities in grain production to increase grain self-sufficiency. Efforts should be made to increase arable land output, build high-quality farms, and protect the country's minimum 120 million hectares of arable land. Research on seed technology should be increased, as well as seed bank development and seed resource protection, to assure seed security. Public awareness of the importance of minimizing food waste in the production, distribution, storage, and processing chains of food should be raised. Major global grain corporations and multinational agribusinesses should be fostered to develop entire value chains, including production, processing, storage, and logistics.

3.3 Facilitating Technology-Industry-Finance Circulation

Technology and finance form the lifeblood of the modern industrial system. Smoothing the technology-finance circulation and integrating the innovation, industrial, capital, and talent chains are essential to creating a modern industrial system and achieving industrial progress. The primary aim is to improve the interaction of technology and industry. To increase the sophistication of the modern industrial system, it is necessary to compensate for shortcomings in technology and industrial strength, to deepen institutional reforms, and to make constant progress in the development of critical technologies to achieve world-class levels and technology independence and self-reliance. The government should integrate the industrial system with the technology research system through comprehensive innovation reforms, and establish firms as technology innovators. Opportunities should be created for corporate technologists to advance in their careers, and corporations should be encouraged to invest more in technological innovation. Businesses should expand their spending on R&D. More collaboration between industry, academia, and research institutions is needed to overcome the technological-economic divide. Policymakers should promote cross-sectoral overlap and integration, expand open access to data resources, improve the value of data resources, and address persistent issues confronting certain sectors.

Second industry-finance circulation should be facilitated. The government is advised to combine finance with the real economy, to focus on the modern industrial system and the real economy's development trends, and to modify the layout and performance evaluation criteria of financial institutions. A diverse and well-functioning financial survey system and a healthy capital market should be established in accordance with the requirements of adequate strength, consistent pace, structural optimization, and sustainable pricing in order to provide targeted financial services to start-up businesses, small, medium-sized, and micro businesses, and enterprises specialized in manufacturing precision, unique, and novel products. Financial services should assist the real economy. Small, medium-sized, and

micro businesses, as well as priority areas such as green development, innovation, and manufacturing, should be given special attention in order to reduce the financing cost of the real economy, increase the sustainability of financial support to the real economy, and better utilize the finance industry's role in stabilizing investment and expanding domestic consumption.

Third, the supply-demand match should be improved. Market demand is more important than financial support in maintaining the positive cycle of technology, industry, and finance. A demand expansion strategy based on China's ultra-large market advantage should be implemented; the optimization and upgrade of new products and technologies in the local market should be accelerated, and should be extended into the international market once a competitive advantage has been established. Steps should be taken to create a unified national market, establish comprehensive domestic industry standards and rules for inspection, testing, certification, and source recognition, in order to create an ecosystem for the recognition of new technologies and products in supply chains, and to accelerate the market application of products and technologies. Innovation and demand-side applications should be supported, our ultra-large market advantage should be capitalized on by incorporating indigenous new-dynamism products into major national projects and urban construction, the public should be encouraged to purchase home-designed products, and a business ecosystem should be built for the adoption of domestic core technology. The building of new-dynamism infrastructure should be increased and qualified regions should be assisted in taking the lead in the development of new infrastructure such as 5G, computing power, and smart vehicle test fields.[11]

Fourth, talent and other high-end factors should be assured. In accordance with the modern industrial system, educational authorities should optimize university majors and curricula, promote joint educational programs between universities and businesses, scientific research institutions, and government-affiliated agencies, and increase the cultivation of cross-disciplinary professionals in the fields of AI, biomedicine, new energy, and new materials. Entrepreneurs, investors, and researchers all deserve a lot of credit. Care and support for great entrepreneurs should be encouraged while also unleashing the vitality of human resources. Improvements should be made in the arrangements for highly qualified expatriates to work and study in China, as should efforts to recruit international students and scientists to collaborate with Chinese institutions on scientific research and innovation. To this end, government incentives such as forward-looking scientific research programs, internationally influential research platforms, unified scientific research teams, competitive remuneration, and assurances of healthcare and education should be provided. The goal is to make China a magnet for top scientists from both home and abroad.

3.4 Developing World-Class Industrial Clusters

Regional clusters are important for industrial development. They are vehicles for global industrial competition and avenues for industrial upgrading and development (Sheng, 2019b). The establishment of industrial clusters should be prioritized in order to strengthen technological and economic links between firms of all sorts and to encourage the concentration of production factors and resources. Efforts should be made to improve upstream and downstream industry coordination, to establish advanced world-class manufacturing clusters, internationally competitive digital industry clusters, strategic emerging industry clusters, and modern services clusters, and to improve the integrity of the manufacturing system and the sophistication of modern industries.

To start with, the government is advised to optimize industrial layout via clustered development. Policymakers should consider the entire country as a single chessboard, directing regions to make the most of their unique strengths, encouraging the growth of specialized, high-tech industrial hubs, and

[11] Wang Changlin, and Chaoxun Sheng, "Strengthening the Industrial Foundation of the New Development Paradigm," *Economic Daily*, May 24, 2023, page 10.

emphasizing the importance of expertise, specialization, and distinctiveness. Localities should focus on their strengths rather than trying to be all things to all people.

Second, corporate entities should be cultivated through clustered development. The government should unleash the dynamism of the private sector, promote investment in supply chains of leading enterprises, and develop coordination of the supply chain and public service platform for industrial clusters. Local governments should collaborate to construct industrial ecosystems, promote a group of leading enterprises and industry champions, increase high-quality enterprises, and develop world-class enterprises.

Third, foster industrial clusters to create a favorable atmosphere for industrial development. It is recommended that an effective market be combined with a capable government, that technology innovation and application be encouraged, that infrastructure be built to meet future needs, that high-end, smart, and green transitions be promoted, and that efforts be made to build a business ecosystem suitable for industrial development.

Fourth, improve industrial openness through clustered development. It is recommended that a set of competent platforms and economic openness vehicles be established to meet the development needs of firms within each cluster in order to draw global resources and factors to China. International supply chain cooperation should be strengthened in order to explore new business modes and pathways, such as "two countries, two parks" for cross-border industrial chain cooperation, in order to promote integrated industrial chain development.

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