

THE TECHNOLOGICAL DEPENDENCE IN THE ERA OF INTELLIGENT ECONOMY AND NATIONAL ECONOMIC SECURITY FROM THE PERSPECTIVE OF POLITICAL ECONOMY

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Abstract: With the rapid development of technologies such as artificial intelligence, big data, cloud computing, and intelligent manufacturing, the global economy is undergoing a profound transformation from digitalization to intelligence. The intelligent economy, as a new economic form driven by artificial intelligence technology, is characterized by data becoming a key production factor, algorithms becoming an important organizational method, computing power becoming a basic support system, and artificial intelligence systems gradually participating in production decision-making and value creation processes. From a political economy perspective, technological changes not only alter production efficiency but also change the structure of production materials and economic power relations. In the industrial economy era, machine equipment, energy, and capital constituted the main production materials; in the intelligent economy era, data resources, artificial intelligence models, algorithm systems, and digital infrastructure have gradually become new strategic production materials. Changes in the control of production materials further influence the global economic competition landscape, elevating the issue of technology dependence from the level of enterprise competition to that of national economic security. This article, based on the political economy analysis framework, explores the economic foundation, mechanism of action, and impact on national economic security of the formation of technological dependence in the intelligent economy era. The research suggests that technological dependence in the intelligent economy era is not a simple technological level gap, but an economic relationship formed by the control of production materials, the global industrial chain structure, and differences in innovation capabilities. Reducing technological dependence requires enhancing independent innovation capabilities, improving the intelligent economy industrial system, strengthening data governance capabilities, and building an open and cooperative economic security system.

Keywords: Intelligent economy; National economic security; Artificial intelligence; Digital production materials

1 INTRODUCTION

The development of human economies has been closely associated with continuous advances in productivity and evolving modes of production. During the agricultural economy era, land, as a primary productive resource, played an important role in shaping economic activities. With the advancement of industrialization, machinery, energy systems, and capital investment gradually became important drivers of economic development. In the digital economy era, data resources, information networks, and digital technologies have increasingly become important foundations for economic growth and transformation.

Currently, a new wave of technological advancement, represented by artificial intelligence, is contributing to the global economy's transition toward an intelligent economy. Compared with the traditional digital economy, the intelligent economy is characterized by the expanding role of artificial intelligence, which is developing from an information processing tool into an important component of modern production processes. Intelligent systems can support prediction, optimization, and decision-making through data-driven learning, thereby promoting the transformation and enhancement of traditional production and organizational practices.

Previous studies have suggested that the intelligent economy is a new economic form formed on the basis of the digital economy and driven by the latest generation of artificial intelligence technologies. Its core lies in the integrated development of elements such as data, algorithms, and computing power [1-2]. At the same time, research on the new quality productive forces of the digital economy indicates that digital technologies are driving profound changes in workers, labor materials, and labor objects, and information, knowledge, and data are gradually becoming important components of the productive system [3].

From the perspective of political economy, the changes brought about by the intelligent economy are not only technological upgrades but also changes in the structure of production materials. Whoever can control data resources, core algorithms, and intelligent infrastructure is likely to gain an advantage in future economic competition. Therefore, the issue of technological dependence has become an important entry point for understanding national economic security.

2 THE CHANGES IN THE STRUCTURE OF PRODUCTION MATERIALS IN THE ERA OF INTELLIGENT ECONOMY

Marxist political economy holds that the means of production constitute an important material foundation for the development of social production activities and are also a crucial entry point for understanding the relations of production and the economic power structure. The fundamental differences among different economic eras lie not only in what is produced but also in the type of labor tools employed for production. As productivity has advanced, the forms and characteristics of productive resources have continued to evolve, contributing to significant changes in economic structures and production patterns. During the agricultural economy era, land was a primary productive resource, and land-use arrangements played an important role in shaping resource allocation and patterns of economic activity. With the advancement of industrialization, machinery, energy systems, and capital investment became important elements supporting production development, contributing to the modernization and organization of production processes. In the intelligent economy era, productive resources have continued to develop toward digital and intelligent forms, with data, algorithms, computing power, and artificial intelligence infrastructure gradually becoming important components of modern production systems.

Intelligent economy is not a simple continuation of digital economy; rather, it is a new economic form formed by the promotion of artificial intelligence technology on the basis of digital economy. Existing research indicates that intelligent economy takes data as the key production factor, with computing power as the basic support and algorithms as the core driving force. Its essence is the profound changes in production methods and labor materials. Unlike traditional digital economy, which mainly addresses issues of information transmission, resource matching, and transaction efficiency, the artificial intelligence systems in intelligent economy begin to further participate in knowledge production, decision optimization, and complex task execution, gradually transforming labor materials from simple information processing tools into production forces with certain intelligent capabilities.

Firstly, data has become an important production material in the intelligent economy era. Unlike traditional production materials, data has non-consumption, replicability, and continuous value-added characteristics. On the one hand, data can be reused by multiple entities and continuously generates new economic value through processing and analysis; on the other hand, the scale and quality of data directly affect the training effect of artificial intelligence models and become an important factor determining the capabilities of the intelligent system. Relevant research indicates that data, as a new production factor, is changing the traditional production mode and promoting the transformation of economic activities from resource-driven to data-driven. In the intelligent economy system, enterprises form new competitive advantages through data collection, processing, and application, and data resources thus no longer merely serve as auxiliary production information resources but gradually become an important foundation influencing value creation.

Secondly, algorithms have become an important mechanism connecting data resources and economic activities. In traditional industrial production, the production process mainly relied on human experience judgment and mechanical equipment execution; in the intelligent economy, algorithms achieve prediction, optimization, and automatic decision-making by analyzing large amounts of data. For example, in the field of intelligent manufacturing, algorithms can adjust production processes based on production data to improve resource utilization efficiency; in the platform economy field, algorithms can achieve supply-demand matching and market regulation. Therefore, algorithms are not only a technical tool but also gradually become an important way to organize economic activities. Economic entities with advanced algorithm capabilities can more effectively utilize data resources and form sustained competitive advantages.

Thirdly, computing power has become the fundamental production condition for the development of intelligent economy. The development of artificial intelligence models requires a large amount of computing resources support, especially for the training and operation of large-scale artificial intelligence models, which places higher demands on high-performance chips, computing centers, and cloud infrastructure. Relevant research indicates that computing power has become an important infrastructure in the digital era, and its development level directly affects the innovation of artificial intelligence technology and the application capabilities of industries [4]. Therefore, chip manufacturing capabilities, computing resource supply capabilities, and the level of digital infrastructure construction are becoming important indicators for measuring a country's intelligent economic development capabilities.

From the perspective of political economy, the changes in the structure of production materials in the era of intelligent economy imply that the economic power relations are undergoing a re-adjustment. During the industrial capitalist period, capital acquired production control capabilities by possessing machines, factories, and natural resources [5]; in the era of intelligent economy, data resources, algorithmic systems, and artificial intelligence infrastructure have gradually become new control objects. Entities that possess key digital production materials can gain greater advantages in industrial competition and global value chains, while entities lacking relevant capabilities may form new technological dependencies.

Therefore, the digital transformation of production materials in the era of intelligent economy does not merely signify technological progress; it represents a systematic change in production methods and economic relations. Understanding the position of data, algorithms, and computing power in the production system is an important theoretical foundation for analyzing the issues of technological dependence and national economic security in the era of intelligent economy.

3 THE POLITICAL ECONOMIC MECHANISM FORMED BY TECHNOLOGICAL DEPENDENCE

Technological dependence is not merely a gap in technological development levels; it is an economic relationship formed by differences in control capabilities of production materials, global industrial chain division structure, and innovation systems. In the traditional industrial economy era, technological dependence was mainly manifested as reliance on advanced equipment, production processes, and industrial systems; while in the intelligent economy era, the objects of technological dependence have further expanded to artificial intelligence models, core chips, data resources, algorithm systems, and digital infrastructure, as new production materials. Due to the high technological, capital-intensive, and knowledge-intensive nature of these resources, a new technological concentration pattern has gradually emerged in the intelligent economy field.

Firstly, the high complexity of core technologies in the intelligent economy has driven the concentration of technological advantages. The development of artificial intelligence is not a single technological breakthrough, but a systematic innovation process supported by basic theories, algorithm models, computing capabilities, data resources, and industrial ecosystems. Especially the development of large-scale artificial intelligence models requires a large amount of high-quality data, high-performance computing equipment, and long-term R&D investment as a foundation [6]. This high technical threshold enables a few economic entities with strong research capabilities, capital strength, and industrial foundations to first form technological advantages and further expand their leading position through continuous investment.

From a political economy perspective, this phenomenon of technological concentration reflects the formation of new production material control relationships. In the industrial economy era, capital obtained economic advantages by controlling machinery equipment and production materials; in the intelligent economy era, entities controlling data resources, algorithm capabilities, and computing infrastructure can also obtain stronger economic dominance. When key technological resources are concentrated in a few entities, other economic entities need to acquire relevant capabilities through technology introduction, platform reliance, or external cooperation to achieve intelligent development. This forms a technological dependence relationship.

Secondly, the global industrial chain structure further strengthens technological dependence in the intelligent economy era. The development of the intelligent economy is based on a highly complex global industrial system, which covers multiple links such as basic chip manufacturing, computing equipment production, software system development, artificial intelligence model training, and industrial applications. Different countries and regions have different positions in the global value chain, with some economies controlling core technologies and key links in the chain, while some economies are more involved in application and market links [7]. Although this division of labor structure improves global resource allocation efficiency, it may also lead to uneven distribution of technological capabilities. When an economy is long-term in the low value-added links of the chain and relies on external supply for key technologies and infrastructure, its industrial upgrading and innovation development may be constrained. Therefore, the industrial competition in the intelligent economy era is not only about product and market competition, but also about competition over the control rights of key production materials.

Furthermore, the importance of data resources further strengthens the cumulative effect of technological dependence. Artificial intelligence technology has a clear data-driven characteristic. High-quality data can improve model training effects, and stronger model capabilities can attract more users and application scenarios, thereby generating new data accumulation. This "data accumulation - model optimization - application expansion - more data generation" cycle mechanism enables entities with rich data resources and advanced algorithm capabilities to continuously strengthen their competitive advantages. At the same time, data resources are not simple information resources but gradually become strategic resources influencing the development of the intelligent economy. Entities lacking data acquisition capabilities, data processing capabilities, and data governance capabilities may struggle to form a competitive artificial intelligence system. Therefore, technological dependence in the intelligent economy era not only manifests as reliance on a certain technology, but also as reliance on an entire intelligent production system.

Finally, differences in innovation systems are also an important factor in forming technological dependence. The development of artificial intelligence is characterized by long-term accumulation, which requires the joint efforts of a stable research system, a talent cultivation system, an industrial ecosystem, and a capital support system. An economy with a well-developed innovation system can continuously drive technological iteration and form a positive cycle; while an economy with a weak innovation foundation, even if it achieves short-term development through technology introduction, may struggle to develop long-term independent innovation capabilities [8]. Therefore, the formation mechanism of technological dependence in the era of intelligent economy is more complex. It not only stems from the technological gap, but also from the control ability of new production materials, the position of the global industrial chain, and differences in the innovation system. From the perspective of political economy, technological dependence essentially reflects the relationship of possession and control of production materials in the era of intelligent economy, and is also an important foundation for understanding national economic security issues.

4 TECHNOLOGICAL DEPENDENCE AND NATIONAL ECONOMIC SECURITY

National economic security refers to the ability of a country's economic system to maintain stable operation and continuous development in a complex external environment. Its core lies in ensuring the autonomy, stability, and resilience of economic development. In traditional economic systems, national economic security was mainly focused on energy supply, financial stability, food security, and the integrity of the industrial system. However, with the development of intelligent economy, economic operations increasingly rely on digital technologies such as artificial intelligence, big

data, and cloud computing. Technological factors have gradually become important variables affecting national economic security. In the era of intelligent economy, technological dependence no longer restricts itself to a single industry or enterprise level, but gradually influences the national industrial structure, innovation capabilities, and the stability of the economic system.

From the perspective of political economy, the essence of national economic security issues lies in the control ability of key production materials. In the industrial economy era, energy resources and industrial manufacturing capabilities were important factors determining economic competitiveness; while in the era of intelligent economy, data resources, artificial intelligence technologies, computing infrastructure, and digital industrial ecosystems are becoming new strategic production materials. When an economy fails to control key production materials, its economic development may be constrained by external technological systems. Therefore, technological dependence not only manifests as the problem of technology acquisition, but also reflects the issue of economic autonomy and development initiative.

Firstly, technological dependence may affect industrial security and the ability of industrial upgrading. The intelligent economy is promoting the transformation of traditional industries towards intelligence, with manufacturing, services, agriculture, and finance gradually relying on artificial intelligence technology to achieve efficiency improvement and model innovation. For example, intelligent manufacturing requires industrial software, intelligent control systems, and data analysis capabilities to achieve production optimization; modern services rely on algorithm systems to enhance resource allocation efficiency. If key technologies are long-term dependent on external supply, then the intelligent upgrading of industries may be restricted, and enterprises may struggle to form continuous innovation capabilities.

Industrial security not only lies in whether there is a complete industrial system, but also in whether there is control ability over key links. In the global industrial chain system, some economies control core technologies and high value-added links, while others mainly undertake application and production links. When key technologies, core equipment, or basic software rely on external supply, the industrial system may face greater uncertainty. Therefore, the competition in the era of intelligent economy is essentially a competition centered around technological capabilities and control of production materials.

Secondly, technological dependence may affect the construction of the national innovation system. Artificial intelligence technology has a clear cumulative characteristic; its development is not simply based on a single technological breakthrough, but relies on long-term research and development investment, talent cultivation, data accumulation, and industrial application feedback to form a continuous cycle. Economies with strong innovation systems can promote industrial upgrading through technological progress and further obtain data resources and market advantages, forming a positive feedback mechanism.

On the contrary, if an economy relies on external technology input for a long time, although it can obtain advanced technology application capabilities in the short term, it may struggle to form an independent innovation system. Technological dependence may lead to innovation activities being more concentrated on technology application, while the basic research and core technology breakthrough capabilities are insufficient. In the long run, this structure may limit the autonomy of economic development and make the economic system vulnerable to changes in the external technological environment.

Finally, technological dependence may affect the security of digital infrastructure. The intelligent economy highly relies on digital infrastructure, including data centers, cloud computing platforms, network systems, and artificial intelligence computing resources. These infrastructures have become important supports for modern economic operation. If key digital infrastructure has a high degree of external dependence, it may increase the risk of economic operation. For instance, the development of the artificial intelligence industry requires a large amount of computing resources, and the computing infrastructure relies on chips, servers and energy systems for support. Therefore, computing security has gradually become an important component of national economic security. Thus, enhancing the autonomy of digital infrastructure is an important condition for ensuring the stable development of the intelligent economy.

Furthermore, technological dependence may also affect a country's economic governance capabilities. In the era of intelligent economy, data has become an important production factor, and economic activities increasingly rely on data collection, analysis and application capabilities. If there is a lack of an effective data governance system, it may lead to insufficient utilization efficiency of data resources and even affect the security of economic operation. Therefore, data governance capabilities not only relate to enterprise competition, but also to the economic governance capabilities of the country. However, it should be noted that reducing technological dependence does not mean completely separating from the global technological system. Modern economy is highly globalized, and no country can complete all technological links independently. A reasonable economic security strategy is not to pursue absolute isolation, but to enhance the autonomy of key fields and improve the resilience of the industrial chain and innovation system on the basis of open cooperation.

Therefore, the connotation of national economic security in the era of intelligent economy is changing. From the traditional sense of resource security and industrial security, it has gradually expanded to technological security, data security, innovation security and digital infrastructure security. The core of the issue of technological dependence is not whether to use external technologies, but whether to have the autonomy to develop in key fields. Only by mastering the control of core production materials can one maintain the stability and initiative of economic development in the era of intelligent economy.

5 REDUCE TECHNOLOGICAL DEPENDENCE AND BUILD AN INTELLIGENT ECONOMIC SECURITY SYSTEM

In the era of intelligent economy, reducing technological dependence does not mean breaking away from the global technological system; instead, it means enhancing the autonomous development capabilities in key areas on the basis of open cooperation, and improving the stability and resilience of the economic system. From the perspective of political economy, the solution to the problem of technological dependence essentially involves enhancing the control over new production materials. Therefore, it is necessary to build a national economic security system that is adapted to the development of the intelligent economy, focusing on aspects such as the construction of innovation systems, optimization of the industrial chain, data governance, and international cooperation.

Firstly, efforts should be made to enhance independent innovation capabilities and strengthen the development capabilities in key technological fields. The competition in the era of intelligent economy is essentially a competition among innovation systems. Fields such as artificial intelligence, advanced chips, industrial software, and intelligent infrastructure have high technical barriers and cannot achieve long-term competitive advantages through short-term technology introduction. Therefore, it is necessary to increase investment in basic research, promote the combination of basic theoretical breakthroughs and industrial technological innovation, and form a complete innovation chain from scientific research results to industrial application. Compared with the traditional technological development model, technological innovation in the intelligent economy is more dependent on multi-party collaboration. The development of artificial intelligence technology not only requires theoretical support from universities and research institutions, but also requires enterprises to participate in technological research and market application. Therefore, it is necessary to further promote the deep integration of industry-university-research cooperation, and improve the efficiency of technology transfer through the integration of innovation resources. At the same time, it is necessary to strengthen the cultivation of talents in the field of artificial intelligence, and form a long-term talent system supporting the development of the intelligent economy.

Secondly, the intelligent economy industrial system should be improved to enhance the autonomy of the industrial chain. One of the important manifestations of technological dependence is the high dependence of key industrial links on external systems. Therefore, reducing technological dependence requires shifting from single-point technological breakthroughs to industrial system construction. The development of the intelligent economy involves multiple links such as chip manufacturing, basic software, cloud computing platforms, data resources, artificial intelligence models, and application scenarios. The development of any single link cannot form a complete competitive capability. Only by establishing a complete industrial ecosystem covering research, manufacturing, application, and service can the stability of the industrial system be improved. At the same time, the resilience of the industrial chain should be emphasized. In the context of highly interconnected global economy, a completely closed industrial system is neither realistic nor in line with the laws of technological development. Therefore, it is necessary to improve the adjustment ability in the face of external risks through diversified supply systems, key technology reserves, and industrial collaboration mechanisms.

Thirdly, data governance capabilities should be strengthened to enhance the management capabilities of digital production materials. In the era of intelligent economy, data has become an important production factor, and its value lies not only in the scale of resources but also in data governance and application capabilities. How to achieve the effective utilization of data resources while ensuring data security is an important aspect of national economic security. On one hand, it is necessary to promote the rational circulation of data resources and improve the efficiency of data utilization. Data can only be transformed into economic value through processing, analysis, and application. On the other hand, a complete data security system should be established to prevent the unreasonable utilization of important data resources or the impact of external risks. From the perspective of political economy, data governance is not only a technical issue but also a problem of production material allocation. A reasonable data governance mechanism can promote the release of data value while avoiding economic power imbalance caused by excessive concentration of data resources.

In addition, the construction of computing infrastructure should be strengthened to enhance the basic support capacity of the intelligent economy. Computing power is an important foundation for the development of artificial intelligence and a crucial resource for the operation of the intelligent economy. As the scale of artificial intelligence models continues to expand, the demand for computing resources is continuously increasing. Therefore, it is necessary to promote the construction of computing infrastructure to increase the supply capacity of computing resources. Computing infrastructure construction includes not only hardware facilities but also energy support, network systems, and computing resource scheduling capabilities. The future intelligent economic competition among countries will not only be reflected in algorithm innovation, but also in the ability to build computing infrastructure. Therefore, enhancing the autonomous guarantee capability of computing power is an important direction for strengthening national economic security.

Finally, we should adhere to open cooperation and improve the international coordination ability for the development of intelligent economy. Intelligent economy has a highly globalized feature. The development of artificial intelligence technology cannot be separated from international knowledge exchange, industrial cooperation and technological interaction. Reducing technological dependence is not building a closed system, but enhancing one's own ability in an open environment. Under the background of the continuous adjustment of the global industrial system, it is necessary to actively participate in international technological cooperation and the formulation of governance rules, and through cooperation to reduce development risks. At the same time, we should improve our own innovation ability and industrial competitiveness, so that open cooperation is based on a more equal and stable foundation.

6 CONCLUSION

The development of the intelligent economy is driving the global economy into a new historical stage. Its impact is not only reflected in the improvement of production efficiency and the innovation of industrial models, but also in the profound changes in the structure of production materials, economic power relations, and the ways of national competition. From a political economy perspective, this article argues that in the era of intelligent economy, data, algorithms, computing power, and artificial intelligence infrastructure are becoming new production materials, and are gradually influencing the way resources are allocated and the value creation mechanism in economic activities. Compared with the industrial economy era, the technological competition in the intelligent economy era is more reflected in the competition for control of new production materials.

The essence of the problem of technological dependence is not simply a difference in technical levels, but rather a manifestation of the possession relationship of production materials and the structure of industrial division in the global economic system. When key technologies, data resources, and digital infrastructure are highly concentrated in a few entities, technological dependence may affect the ability of industrial upgrading, the construction of innovation systems, and the level of national economic security.

Therefore, the national economic security in the era of intelligent economy needs to go beyond the traditional scope of resource security and industrial security, and incorporate technological security, data security, innovation capabilities, and digital infrastructure security into a new economic security system. The key to reducing technological dependence is not to reduce international exchanges, but to enhance the autonomy and resilience of economic development through independent innovation, improvement of the industrial system, and improvement of governance capabilities.

In the future, as artificial intelligence technology further develops, the intelligent economy will become an important field of global economic competition. Economies that can effectively grasp new production materials, build a complete innovation system, and achieve technological autonomy will have a more stable development foundation in the era of intelligent economy. Therefore, building a secure, open, innovative, and resilient intelligent economy system will become an important strategic direction for future national economic development.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

- [1] Zhou Wen, Yang Zhengyuan. On Intelligent Economy: Its Connotation, Characteristics, Development Trends and Strategic Choices. *Reform*, 2025(9): 1-15.
- [2] Zhou Weilian, Li Yaping. Research on the Impact Mechanism of Intelligent Economy on the Development of New Quality Productivity. *East China Economic Management*, 2025, 39(8): 50-60. DOI: 10.19629/j.cnki.34-1014/f.250422023.
- [3] Ren Baoping, Zi Weyue. The Logic and Pathways of Digital New Quality Productivity Driving High-Quality Economic Development. *Journal of Xiangtan University (Philosophy and Social Sciences Edition)*, 2023, 47(6): 23-30. DOI: 10.13715/j.cnki.jxupss.2023.06.002.
- [4] Qiao Xiaonan, Feng Tianyi, Wang Yi. "Artificial Intelligence +" Empowering High-Quality Development: A Political Economy Study. *Economic Horizons*, 2025(12): 1-13. DOI: 10.16528/j.cnki.22-1054/f.202512001.
- [5] Acemoglu D, Restrepo P. The race between man and machine: implications of technology for growth, factor shares, and employment. *American Economic Review*, 2018, 108(6): 1488-1542.
- [6] Reikhanova I V, Popova L V, Vlasova N Y, et al. The Economic Growth of the Digital Economy in the Age of Intelligent Machines: The Balance of Domestic Efficiency and Global Competitiveness. *International Journal of Trade and Global Markets*, 2023, 18(2/3): 290-301.
- [7] Vechkinzova E A, Ryattel A V, Nabokikh A A, et al. Limits of Involvement of Intelligent Machines in Socio-economic Relations in Emerging Economies. *International Journal of Trade and Global Markets*, 2023, 18(2/3): 302-313.
- [8] Aghion P, Jones B F, Jones C I. Artificial intelligence and economic growth. NBER Working Paper, 2017: 23928.