

SCIENTIFIC AND TECHNOLOGICAL INNOVATION IS THE CORE ELEMENT OF NEW QUALITY PRODUCTIVE FORCES¹

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ABSTRACT

New quality productive forces are the primary driver of high-quality economic development. As the core of new quality productive forces, sci-tech innovation plays a pivotal role in fostering and sustaining their growth. This article analyses the specific features, concept, theory, driving force, and practical needs of new quality productive forces, and argues that the specific features of new quality productive forces derive from sci-tech innovation; the theory of new quality productive forces is rooted in sci-tech innovation; the major driving force behind the evolution of new quality productive forces is sci-tech innovation; and the practical needs for new quality productive forces revolve around sci-tech innovation. On that basis, this article examines how sci-tech innovation influences, shapes, and cultivates new quality productive forces, and proposes that efforts should be made to leverage the leading role of sci-tech innovation, improve the new system for mobilising resources nationwide, and enhance the collaboration between enterprises, universities, and research institutes, so as to continuously reinforce the role of sci-tech innovation in underpinning new quality productive forces.

Keywords: *New Quality Productive Forces; Sci-Tech Innovation; Underlying Linkage; Core Element; Industrial Innovation; Institutional Reform.*

INTRODUCTION

“New quality productive forces” is an important concept first introduced by President Xi Jinping during an inspection tour in Heilongjiang Province in September 2023. It is a fundamental concept providing guidance for China’s high-quality development. President Xi Jinping emphasised the importance of sci-tech innovation for new quality productive forces in a series of important statements. During his 2023 tour of Heilongjiang, President Xi stressed that “sci-tech innovation resources should be integrated to spearhead strategic emerging industries and future industries and accelerate the development of new quality productive forces”. The Central Economic Work Conference in December 2023 suggested that “we should promote industrial innovation with sci-tech innovation, in particular, develop new industries, models and impetus with innovative and cutting-edge technologies, in order to foster new quality productive forces.” At the 11th group study session of the Political Bureau of the CPC Central Committee on 31 January 2024, President Xi noted that “sci-tech innovation can generate new industries, new models and new growth drivers, which are the core elements of the development of new quality productive forces”. This definition fully demonstrates that sci-tech innovation has an enormous, unmatched, and irreplaceable impact on the development of new quality productive forces. To get a deep and accurate understanding of this theory, we need to take a close look at the following five aspects.

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I. The Specific Features of New Quality Productive Forces Derive from Sci-Tech Innovation

President Xi Jinping has pointed out that *“new quality productive forces represent a new type of advanced productivity that is compatible with the new development philosophy. Granting a leading role to innovation, they mark a break with traditional economic growth models and development pathways for productive forces and feature a high level of technology, efficiency, and quality”*. That is to say, the specific features of new quality productive forces derive from sci-tech innovation.

First, sci-tech innovation is critical to breaking free from traditional economic growth modes and productivity development paths. The transformation of economic growth modes is essentially a process in which productive forces keep evolving. The continuous optimisation and upgrading of productive forces signifies a successful transformation of economic growth approaches. In contrast, the long-term stagnation of productive forces indicates that the transformation faces significant challenges. In this case, to develop new quality productive forces, it is imperative that economic growth breaks free from traditional paths and evolves into a higher-level, higher-quality mode with higher efficiency. In this case, continuous new development momentum is required to achieve this transformation. Therefore, the perspective, the cultivation of new drivers of growth is directly related to sci-tech innovation. That is why the CPC Central Committee has, on many occasions, called for fostering new industries, new models, and new drivers of growth with innovative and cutting-edge technologies. It is fair to say that sci-tech innovation is critical for shifting away from traditional growth modes and productivity development paths.

Second, high technology, high efficiency, and high-quality rest upon sci-tech innovation. High technology, high efficiency, and high quality are the main features of new quality productive forces, and these three features won't happen without sci-tech innovation. High technology dictates that both production factors and means of production should be more technologically advanced, which places a higher requirement for the development of new quality productive forces on the input side. High efficiency is primarily a requirement in the intermediate production process, imposing higher demands on the input-output efficiency of the production process. Sci-tech innovation is the primary formula for improving productivity. The feature of high quality, on the output side, demands a higher quality of final products. By the same token, sci-tech innovation is a key factor for improving and ensuring product quality.

Finally, new quality productive forces aligned with the new development philosophy depend on sci-tech innovation. The new development philosophy embodies the concept, direction, and focus of China's development in the new era. It serves as a guiding principle of comprehensive and far-reaching significance, providing fundamental guidance for promoting high-quality development, and a basis for developing new quality productive forces. Innovation comes first in the philosophy of innovative, coordinated, green, open, and shared development, as the primary driving force in the dynamism of development. As such, to develop new quality productive forces aligned with the new development philosophy, it is necessary to ground our efforts in innovation as the fundamental driving force and integrate innovation into all our work.

II. The Concept of New Quality Productive Forces is Essentially Anchored in Sci-Tech Innovation

To understand exactly what new quality productive forces mean, we must first understand the concept of productive forces. Throughout the development of Marxist theory and its entire system, the concept of productive forces comes in different types and definitions. In his masterpiece *Capital*, Karl Marx uses different concepts of productive forces, for example, material productive forces, social productive forces, subjective productive forces, spiritual productive forces, direct productive forces, and potential productive forces. Whatever source do these different concepts of productive forces come from, one definition widely accepted by scholars is that productive forces refer to the ability of humans to transform nature to meet their own needs. Therefore, productive forces are essentially an ability, and developing new quality productive forces is the process of continuously enhancing this ability.

In Marxist political economy, productive forces encompass labourers, means of labour, and subjects of labour. Changes in these three factors inevitably exert effects on productive forces. It means that compared to traditional productive forces, new quality productive forces come into being because new changes take place in labourers, means of labour, and subjects of labour. As new quality productive forces feature high technology, high efficiency, and high quality, these new changes must be based on sci-tech innovation in order to catalyse qualitative changes in productive forces.

In terms of changes in labourers, the role of sci-tech innovation is reflected in the improvement of sci-tech innovation capabilities. It has been proven at home and abroad that when a country provides large-scale education and skill training programmes for the workforce, the country's capacity for sci-tech innovation will be significantly enhanced, thus, creating a contingent of talent capable of original innovation, which will undoubtedly boost the cultivation of new quality productive forces.

Regarding changes in the means of labour, sci-tech innovation leads to the emergence of more efficient instruments of labour, which can significantly improve productivity, as an important driving force for cultivating new quality productive forces. Instruments are generally considered a key gauge of productive forces. The more advanced the instruments and the higher their efficiency, the more advanced the productive forces. From the Agricultural Age to the Industrial Age and the Information Age, history shows that evolving instruments of labour can sustainably drive the development of productive forces and the whole society, as evidenced by steam engines in the First Industrial Revolution and electric motors in the Second Industrial Revolution. Further analysis of these instruments of labour, which have led to epoch-making, revolutionary, and fundamental changes in productive forces, reveals that they are all the results of the sci-tech innovation of their time. Therefore, the development of new quality productive forces is premised on new instruments of labour powered by the latest outcomes of sci-tech innovation.

As to changes in the subjects of labour, sci-tech innovation gives rise to new industries and fields, which unlock more possibilities for fostering new quality productive forces. For example, China's digital economy has been developing rapidly in recent years, bringing about profound changes to and even reshaping the traditional industrial structure and employment system. New industries and new occupations related to the digital economy have mushroomed, which has not only enhanced the economic momentum, but also laid solid groundwork for improving productivity.

III. The Theory of New Quality Productive Forces is Rooted in Sci-Tech Innovation

The theory of new quality productive forces, proposed by President Xi Jinping on the basis of the evolving international landscape and China's development stage, carries forward the Marxist theory of productive forces and reflects the particularity of China's development reality. At the 12th group study session of the Political Bureau of the CPC Central Committee in January 2024, President Xi defined a substantial increase in total factor productivity as a core hallmark. This important proposition points to the theoretical core of new quality productive forces and reveals the underlying linkage between sci-tech innovation and new quality productive forces.

According to classical economics, the three traditional inputs (labour, capital, and land) constitute the primary source of economic growth. However, a growing number of scholars have noticed that in addition to these traditional factors, economic growth is also subject to the influence of other intangible factors. The combined impact of these intangible factors on economic growth is referred to as total factor productivity. Based on relevant theories, the primary sources of total factor productivity growth are technological advancement and more efficient resource allocation. The former depends on sci-tech innovation, while the latter emphasises institutional and system reform. Therefore, total factor productivity can be used to measure the driving forces of economic development. The higher the total factor productivity, the more dependent the driving forces are on sci-tech innovation and institutional innovation.

Over the last 40 years, China has fully exploited its advantages in the efficiency of its economic system and the scale of production factors to establish the world's largest real economy in a short period of time. The nation has achieved a tremendous transformation from growing rich to becoming strong. However, as the economy continued to grow and the hierarchy in its industrial structure evolved, the development mode of the past, especially the traditional path relying on low-cost factor inputs, started to face significant challenges and pressures, which are manifested in structural imbalances in the quantity and quality of factor supply and demand, growing difficulties in sustained industrial upgrading, and rising overall costs of development. These headwinds set more pressing requirements on the transformation of development modes. Against this backdrop, the concept of "new quality productive forces" again highlights the key role of sci-tech innovation in economic development, and a substantial increase in total factor productivity is regarded as a core hallmark, sending clear messages on the transformation of development modes.

On the one hand, innovations in labourers, means of labour, and subjects of labour are a corollary of technological advancement and serve as the primary driving force of total factor productivity growth. This shows that the process in which new quality productive forces are formed is also the process in which technological advancement leads to an increase in total factor productivity. On the other hand, in addition to separate innovations in labourers, means of labour, and subjects of labour, their combination and optimisation can unleash new development momentum, providing a second driving force for total factor productivity growth. It is thus evident that new quality productive forces and total factor productivity are closely intertwined, both on an individual and an aggregate level. The development of new quality productive forces is essentially a process in which total factor productivity increases, and a process in which the economic growth mode transforms to high-quality development.

IV. The Major Driving Force Behind the Evolution of New Quality Productive Forces is Sci-Tech Innovation

The development of productive forces is not a static but a constant and dynamic process. Variations in productive forces result from changes in different factors, including the scale of production factors, industrial structure, technological advancement, resource endowment, and institutions. It is also important to note that not every change in productive forces will give rise to new quality productive forces. In fact, throughout human history, while productive forces have been in a constant state of evolution, truly revolutionary shifts in productive forces and the emergence of new quality productive forces have only occurred during several industrial revolutions. Thus, the fostering of new quality productive forces involves both quantitative changes across various areas and qualitative changes in key areas as driving forces. As can be seen from the onset of previous industrial revolutions, these key areas primarily fall within the scope of sci-tech innovation.

As a matter of fact, every country that brought about an industrial revolution was, without exception, an international centre for sci-tech innovation at the time. During the First Industrial Revolution, Britain led the world in sci-tech innovation. The great advance in production efficiency fuelled by steam engines and the disruption caused by railways to traditional modes of transportation both demonstrated its pre-eminence in the field of sci-tech innovation. During the Second and Third Industrial Revolutions, the United States overtook Britain to be the new international innovation centre, as manifested in its leadership in basic research, the wide adoption of electrical appliances and automobiles, and the great appeal of its higher education system.

In cause-and-effect terms, the reason why industrial revolutions originate in international centres of sci-tech innovation can be largely attributed to three key factors: new energy types, new industries, and new modes of transportation, all of which hinge on sci-tech advancements. In the energy sector, every energy revolution is the result of breakthroughs in fundamental disciplines such as physics and chemistry. The emergence of new industries depends on new materials, new production technologies, and new business models, all of which are inextricably linked to sci-tech innovation. Likewise, the emergence of new modes of transportation not only requires new energy sources but also depends on new theories of propulsion and advanced machinery.

A new industrial revolution is rapidly dawning, and countries are gearing up to capitalise on it. In recent years, China's sci-tech innovation capabilities and strengths have been significantly enhanced. According to the National Innovation Index Report released by the China Academy of Science and Technology for Development, in 2023, China ranked 10th worldwide in terms of comprehensive innovation capabilities, moving up from the 30th in 2010. The country has led the world for years in the number of R&D personnel, patent filings, and publications in SCI-indexed journals, and stayed among the top in terms of innovation in new energy-related industries. These achievements combined constitute the engine driving this emergent industrial revolution. On that basis, the CPC Central Committee has decided to foster new quality productive forces with innovative and cutting-edge technologies, which aligns with the trend of China's sci-tech innovation and helps consolidate and further leverage the strength of its sci-tech innovation system. Meanwhile, it sets a clear direction for the development of productive forces and for us to pool resources to accelerate new industrial revolution.

V. The Practical Needs for New Quality Productive Forces Revolve around Sci-Tech Innovation

In reality, China has a solid foundation and conditions to develop new quality productive

forces. The super-large, unified market generates enormous demand for the cultivation of new quality productive forces, the continuously enhanced capacity for sci-tech innovation gives strong impetus, and the increasingly efficient business environment provides an institutional guarantee. However, it should be noted that these favourable conditions coexist with factors holding back new quality productive forces. For example, bottlenecks in core technologies in some key areas threaten China's development security and pose obstacles to the development of new quality productive forces. The flawed mechanism for collaboration between industries, universities, and research institutes undermines the efficient allocation of production factors and hinders the development of new quality productive forces.

It is obvious that many of the factors hampering the development of new quality productive forces are related to sci-tech innovation, which is the crux of many problems. Therefore, it is imperative to deepen sci-tech institutional reform to enhance the role of sci-tech innovation in fostering new quality productive forces.

To deter the excessively rapid relocation of traditional industries, we must leverage the leading role of sci-tech innovation, and develop new technologies, equipment, and processes that help traditional industries reduce costs and increase efficiency, in light of local conditions, development stages, and difficulties faced by various industries. While consolidating the strengths of traditional industries, we should steadily promote their transformation and upgrading and maintain stability and order in the development of new quality productive forces.

To address bottlenecks in core technologies, we should improve the new system for mobilising resources nationwide, eliminate the technological barriers to the development of new quality productive forces, achieve greater self-reliance and self-strengthening in science and technology, and pool governmental and non-governmental innovation resources to establish a model and mechanism aimed at achieving breakthroughs in core technologies. Meanwhile, we should improve the systems and mechanisms to support original innovation, increase financial support for basic research, gauge the direction of national strategies, strengthen technology foresight, determine the direction and development goals of basic research, and identify the fundamental scientific problems that impede national strategies and the development of future industries. It is also important to strengthen the feasibility study and the selection and evaluation of major basic research projects, make robust arrangements for strategic basic research, and steer basic research toward major technical and engineering problems.

As to collaboration between industries, universities, and research institutes, we should ensure that they always serve the needs of national strategies. On that basis, efforts should be stepped up to build an innovation ecosystem with enterprises as the main actors and develop a sci-tech innovation system featuring efficient collaboration between national laboratories, top research institutes and universities, and innovative leading enterprises, promote closer collaboration between industries, universities, research institutes, and end-users, and enhance the ability to make key technological breakthroughs across fields and disciplines. Additionally, to increase the development efficiency of new quality productive forces, we should engage related industries, upstream and downstream enterprises throughout the industrial chains, as well as small, medium and large enterprises to develop an innovation-oriented cooperation mechanism characterised by close integration between different production factors and different technologies.