

# Research on the Mechanism, Problems and Countermeasures of the Role of Science and Technology Innovation-driven Economic Development



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## Abstract

Science and technology innovation is the main driving force for economic development in the new development stage. In recent years, the scale of investment in R&D in China has grown at a relatively fast pace, and the intensity of investment in science and technology has been increasing. The innovation drive emphasises the use of scientific and technological change and technological innovation to improve the output rate of production factors and the implementation of an efficient and intensive mode of economic growth, thereby promoting sustainable economic development. This paper studies the mechanism of the role of science and technology innovation in driving economic development, elaborates on the current problems faced by science and technology innovation, and puts forward relevant suggestions to adapt to the development of science and technology innovation, such as optimising and adjusting the structure of funding input, improving the mechanism of diversified funding input, and improving the income distribution system of scientific researchers.

## Keywords

Science and Technology Innovation, Economic Development, Drive, Countermeasures

## Introduction

In recent years, the innovation-driven development strategy has continued to drive the growth of China's R&D investment, and scientific and technological innovation has made a major breakthrough. Data show that China's R&D funding investment has increased from 103 million yuan in 2012 to 2.8 trillion yuan in 2021, and the proportion of R&D funding to GDP has continued to rise from 1.98% to 2.44%, showing a steady increase. In terms of growth rate, from 2016 to 2021, the average annual growth rate of R&D expenditure in China is 12.3%, which is higher than that of developed countries such as the United States (7.8%), Japan (1.0%), Germany (3.5%) and South Korea (7.6%). In terms of investment intensity, China's 2.44% S&T investment intensity in 2021 ranks 13th among major countries in the world, surpassing innovative countries such as France (2.35%) and the Netherlands (2.29%). The full-time equivalent of

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R&D personnel increased from 2,883,300 person-years in 2011 to 5,234,500 person-years in 2020. The implementation of innovation-driven development strategy is a major strategic choice for China's economic development and the core direction of transforming the economic development mode (Xu Quanjun, 2022).

## **1. Theory of Science and Technology Innovation and Economic Development**

### **1.1 Technology Innovation**

The concept of innovation was developed by Professor Schumpeter of Harvard University and consists mainly of new technologies, opening up new markets, having new sources of supply based on raw materials, developing new products or providing new attributes to products, providing new forms of organisation, etc., but the differences between this and technological innovation are still to be discovered by further research. According to endogenous growth theory, endogenous R&D and innovation are the core elements driving economic growth and technological progress.

### **1.2 Economic Development**

Economic growth refers to the sustained increase in material goods and services produced by a country or region, expressed as an expansion of economic scale and productive capacity. The connotation of economic growth is relatively narrow compared to economic development, which can be measured by a country's economic development, which includes both economic growth and the changes in economic structure in the process of economic growth.

## **2. Mechanism of the role of science and technology innovation-driven economic development**

### **2.1 Technological innovation for economic growth**

Through technological innovation, enterprises can improve their standardised and large-scale production capacity, reduce production costs and increase labour productivity, and on this basis, promote the formation of economies of scope in the industry. Technological innovation can therefore effectively contribute to the economic growth of enterprises and create economies of scale. The emergence of new industries, new models and new infrastructure will further influence the industrial structure and investment direction of the national economy. In addition, technological innovation provides an effective guarantee of economic growth through its impact on enterprises and industries at the environmental and knowledge levels.

### **2.2 Scientific and technological innovation promotes the transformation and upgrading of industrial structure**

Developed countries have often built an industrial structure based on high technology, and their tertiary industry accounts for about 75% of the national industrial structure. China's tertiary industry output ratio has not previously exceeded 50% for a long time, reaching 53.3% in 2021. In recent years, China's communication industry and information industry, etc., driven by science and technology innovation, have led to the restructuring of the economy's industrial structure and promoted sustained economic growth. At the level of industrial structure optimization, China has taken the premise of not changing the first structure, deeply optimizing the industrial structure and implementing the production model of innovative processes, which has led to an increase in the proportion of tertiary industry.

### **2.3 Scientific and technological innovation drives the structural transformation of production elements**

Factors of production mainly include traditional factors of production and knowledge-based factors. Traditional factors of production include factors other than natural resources, production costs and labour. Knowledge factors refer to production technology and management tools. Under the traditional production concept, the growth of the regional economy is driven by an increase in the number of factors of production resources. Increasing the traditional factors increases production initially, but when a high point is reached, the increase in production decreases. Therefore, the organic integration of knowledge-based factors into traditional factors of production, and the organic fusion of the two, allows for a steady increase in product quality and production, which in turn leads to sustained economic growth.

## **3. The current problems facing science and technology innovation**

### **3.1 The investment structure of research funding is not reasonable enough**

The proportion of basic research investment in internationally important innovative countries has remained above 20% for a long time. Since 2016, basic research funding has increased at an average annual rate of 17.2%, and the pro-

portion of basic research funding in R&D funding has increased significantly. However, the proportion of basic research investment in China to total domestic R&D investment remains relatively low, and the proportion in China will exceed 6% for the first time in 2020 and reach 6.5% in 2021 (Jiang Yumei, Meng Qingchun, & Li Xinyun, 2021). Comparatively speaking, the weakness in basic research leads to the weakness of China's original innovation capability, which inhibits industrial restructuring and high-quality economic development.

### **3.2 Single source of investment in basic research**

In 2021, China's annual investment in basic research reached 181.70 billion yuan, an increase of 23.9% over the previous year. Among them, the central government's investment in basic research reached 72.091 billion yuan. The proportion of enterprise R&D expenditure in basic research is 0.5%, while the proportion of this item in most of the innovation powerhouses in Europe and America is above 5% (Dong Wenliang, Deng Shan, & Wang Xinlei, 2020). China's central government investment accounts for a disproportionately high share of the total investment in basic research, while enterprises, universities and non-profit organisations put in a lower share of basic research funding. The single source of investment in R&D funding is not conducive to solving the problems of key core technologies being restricted at source and the shortcomings of the supply chain of the innovation chain industry chain.

### **3.3 Science and technology evaluation system needs to be improved**

China's financial basic research investment methods are project competition and institutional stability funding, both of which are basically in the same proportion. The current management mode of scientific research projects is relatively single, and there is an imbalance between the level of management and the scale of funding coordination (Xie Fuji, 2020). For example, the project system is short-term, phased and decentralized, making it difficult for researchers to devote themselves to research, which is not conducive to the development of basic research work. In the process of project implementation, a set of fixed processes, such as project application, mid-term evaluation, and final evaluation, make scientific research behavior more deterministic, and expert evaluation tends to be fixed and procedural, which is not conducive to the development of original innovation.

## **4. Suggestions for promoting science and technology innovation and economic development**

### **4.1 Optimize and adjust the investment structure**

To be among the forefront of innovative countries, China must also continue to increase the investment in R&D throughout society, optimize and adjust the structure of investment, especially to increase the proportion of basic research. Accelerate the construction of international science and technology innovation centers, national science centers, regional science and technology innovation centers, national laboratories, etc., and actively promote the manufacturing of cutting-edge equipment with innovative knowledge as well as new technologies at its core.

### **4.2 Improve diversified capital investment mechanism**

At present, the main position of enterprise R&D investment in China is increasing. It is also necessary to give full play to the coordinating power of the government and the market economy to reasonably guide the effective allocation of innovation resources. Through fiscal policy and management system innovation, encourage social funds to invest in R&D activities, vigorously advocate enterprise independent innovation, and increase efforts in tax incentives for enterprise R&D investment to guide social enterprises to increase their research investment (Shi Tao, 2020).

### **4.3 Improve the income distribution system of scientific researchers**

Accelerate the improvement of the "human-centered" basic research investment system, and provide a more liberal research environment for researchers. Accelerate the reform of the income distribution system of scientific researchers, further improve the salary system of scientific researchers, the agreement salary system and other relatively flexible internal distribution methods, so that the salary performance of scientific researchers is related to scientific research efforts and scientific research efficiency, and help scientific researchers to devote themselves to scientific research and create more original achievements for society.

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