Analysis on the Measurement of High-Tech Industry Technological Innovation Efficiency from the Perspective of Absorptive Capacity

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Keywords: High tech industry, Technological innovation, Knowledge economy

Abstract: In the era of knowledge economy, vigorously developing high-tech industries has become a strategic choice for China to seize the commanding heights of the new round of international competition. Regional technological innovation capability, as the export base of technology needed for the development of high-tech industries, plays an irreplaceable role in the development of high-tech industries. Technology absorption has become a key factor affecting regional economic competitiveness. With abundant external technical resources and increasingly market-oriented technology transfer and transaction, how to improve the technological innovation capability of industry and the actual competitiveness of regional economy by strengthening the technological absorption capability of industry, including technology acquisition, storage, learning and transformation, has become an important content of studying industrial and regional technological progress. From the perspective of absorptive capacity theory, this paper puts forward a method to measure the technological innovation efficiency of high-tech industries from the perspectives of technological innovation resource support capacity, technological innovation input capacity and technological innovation output capacity, which provides decision-making basis for comprehensively improving the technological innovation capacity of China's high-tech industries.

1. Introduction

With the advent of economic globalization, the importance of innovation ability in the process of improving international competitiveness is becoming more and more important. High tech industry is an industry with higher knowledge content and technical requirements, less consumed resources, great development and growth, and good comprehensive economic benefits [1]. Nowadays, new technologies and new industries are growing all over the world, and high-tech industry has gradually become the backbone of promoting national economic restructuring and regional sustainable development, guiding the country to strive to improve the international competitiveness of its high-tech industry [2]. With the continuous reform of China's economic system, Chinese enterprises have the internal dynamic mechanism and external institutional environment to pursue scientific and technological progress, and actively carry out technology introduction, with remarkable results [3]. However, the introduction of a technology is only the completion of an ordinary business transaction, and its scale can not be used as a standard to measure the effect of the introduction [4]. In the era of knowledge economy, vigorously developing high-tech industry has become a strategic choice for China to seize the commanding height of a new round of international competition. Compared with traditional medium and low-tech industries, high-tech industries, on the one hand, focus on technological innovation based on R & D, on the other hand, show the location characteristics of spatial agglomeration [5].

High-tech industry, as the main result of the industrialization process of technological innovation capability, represents the development level of the country's advanced technology, and is the main aspect of measuring a country's industrial development potential [6]. At present, the world economy is developing towards an innovative economy. Technological innovation has become an important strategic direction for high-tech industries to gain competitive advantages and a powerful driving force for national economic development. Therefore, technological innovation in high-tech

  DOI: 10.25236/ermss.2021.046

industries has become the core of competition in various countries around the world and a hot spot for academic research. [7]. The impact of the international financial crisis on the world economy is far-reaching, bringing both opportunities and challenges to China's economic development. Every major economic crisis in the world will be accompanied by new breakthroughs in science and technology, which will promote the industrial revolution, give birth to emerging industries and form new economic growth points [8]. Technological innovation capability is a comprehensive capability system composed of several elements. It is the basic driving force for the development of high-tech industries and the core of the competitiveness of high-tech industries. The real evaluation criterion should be whether the imported technology can be transformed into new technology products and emerging industries, and into direct productivity. The realization of this transformation requires us to be good at absorbing and digesting advanced technologies, and on this basis, to innovate continuously to form our own competitiveness. At this point, China is still lacking, especially in the later stage of technology digestion, the lack of digestion, absorption and secondary innovation on the basis of technology introduction [9]. Starting from the ability of technological innovation resource support, technological innovation input ability, and technological innovation output ability, this paper proposes a method for measuring the efficiency of technological innovation in high-tech industries to provide decision-making basis for comprehensively improving the technological innovation ability of China's high-tech industries.

2. Coupling System of High Tech Industry and Regional Technological Innovation Capability

As an important carrier of technology industrialization, enterprises play an important role in the process of transforming technological capital into monetary capital. Intermediaries include financial institutions that provide financing and scientific research institutions that provide technology. Financial institutions are mainly departments that provide funds for technological innovation capacity building and high-tech industry development, while scientific research institutions refer to departments that specialize in training professionals to provide intermediate technology products. Considering factors such as family mobility, social network and familiarity with business environment, entrepreneur resources usually have certain localization characteristics. When some external shocks bring new market opportunities and reduce the cost of entrepreneurial opportunities, entrepreneurs' innovative entrepreneurial behaviors appear, and then form a typical learning-by-doing process. The development goal of high-tech industries is to combine traditional industries with high-tech while cultivating and developing new industries, so as to improve production efficiency, save production resources and increase profits. At present, high-tech industrialization and independent innovation are interrelated and influence each other, and become two very important aspects to promote economic growth. Once the agglomeration of high-tech enterprises has begun to take shape, a large number of production factors such as capital and professional technical talents will be attracted to the agglomeration area, and the development of financial, logistics and other productive services and related infrastructure construction will also be strengthened. Business incubators will further promote the derivation of new enterprises in the agglomeration area, and the emergence and growth of a new generation of entrepreneurs will bring new ideas and new vitality, thus promoting the agglomeration area to enter a benign track of self-maintenance.

The purpose of developing regional technological innovation capability is to apply its achievements to the production of various industries through technological innovation, so that the industries can obtain new production methods, thus achieving the purpose of improving productivity and reducing production costs. On the other hand, technological innovation is not blind. After certain market demand and government demand are formed, it makes innovation investment and innovation environment construction in order to obtain economic benefits. Entrepreneurs with innovative and entrepreneurial spirit can seize the potential market opportunity keenly, create new products or even new enterprises with lower opportunity cost, and then sprout new industrial value chains. With the new product supporting production and service specialization, more related enterprises enter the agglomeration area or are derived from the enterprises in the agglomeration

area, thus promoting the industrial value chain to develop professionally in depth. Due to the close circulation of the development factors of the two systems and the mutual promotion of the development goals, the innovation achievements of the policy of developing technological innovation capability continuously flow to high-tech industries through diffusion effect in the implementation process, and directly or indirectly affect the development of high-tech industries [10]. The industrialization of high technology also provides power for independent innovation, and the development of independent innovation activities also provides technical support for the industrialization of high technology, and the mutual promotion and role of the two create conditions for economic development. During the implementation of the policy of developing high-tech industries, the output of its technical products is conducive to the improvement of local scientific and technological level and directly improves the local technological innovation capability. Its industrial output value is conducive to the improvement of local economic level, increasing investment in innovation and indirectly improving local technological innovation capability. The structure of technological innovation capability is obtained from the elements of technological innovation capability of science and technology enterprises, as shown in Figure 1.

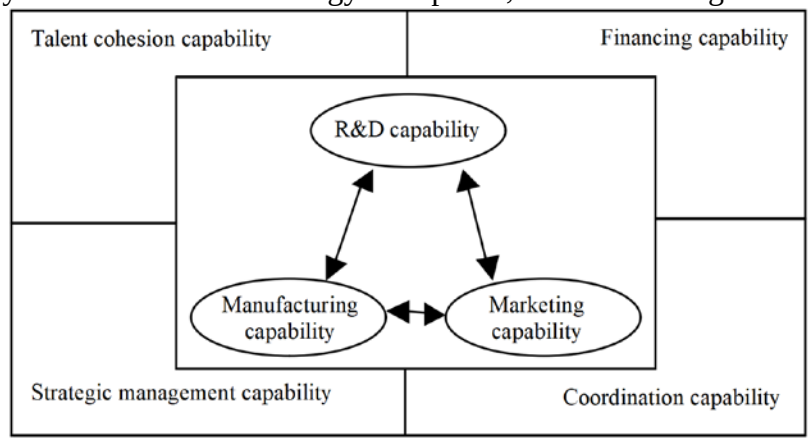

Fig.1 The Structure of Enterprise Technological Innovation Capability

The process of high-tech industrialization contains the third level of independent innovation, that is, research and development activities for economic and social development and improvement of people's living standards. At the same time, as far as technology is concerned, independent innovation also exists in the process of high-tech industrialization, because high-tech industrialization needs technology, which originates from independent innovation. The result of independent innovation is the birth of new technology, and only through the industrialization of technology and the formation of industry can technology play a role in promoting economy. From an economic perspective, high-tech industrialization is a link directly related to economic development, while independent innovation is a link indirectly related to economic development. Independent innovation is a link to prepare for high-tech industrialization, and provides technical source and technical guarantee for high-tech industrialization.

3. Measurement of Technological Innovation Efficiency in High-Tech Industries

Technological innovation activities are accompanied by the whole process of development and evolution of high-tech industries, and the dynamic capability of technological innovation of high-tech industries is the ability to adapt to the changes of internal and external environment and integrate and update all kinds of capabilities possessed. These capabilities are the internal driving forces that drive the development and evolution of high-tech industries. For different high-tech enterprises, their formed capabilities have different directions and sizes. With the development of high-tech industries and the efficiency of regional technological innovation, the trend of regional integration has gradually emerged. The cross-provincial flow of talents, technology and capital, and the cross-regional cooperation of various functional organizations are the main ways to promote the better development of high-tech industries and regional technological innovation capabilities. For

the whole high-tech industry, the development and evolution direction of high-tech industry depends on the driving force direction of powerful or monopolized high-tech enterprises, and the size depends on the combined force of driving forces of many high-tech enterprises. Because the social culture, customs, economic development and administrative means of different provinces in China have strong regional characteristics, the huge differences of economic environment and institutional environment in different regions will inevitably affect the regional innovation ability of different regions in China [11].

Enterprises in the industry take their own resources as production factors, and carry out “new combination” to form technological innovation in a certain sense. Different enterprises carry out different “new combinations” of their own resources to form different technological innovations, while industrial technological innovation depends on the technological innovation formed by powerful and large-scale enterprises. The time relationship of each stage of technological innovation efficiency measurement is shown in Figure 2.

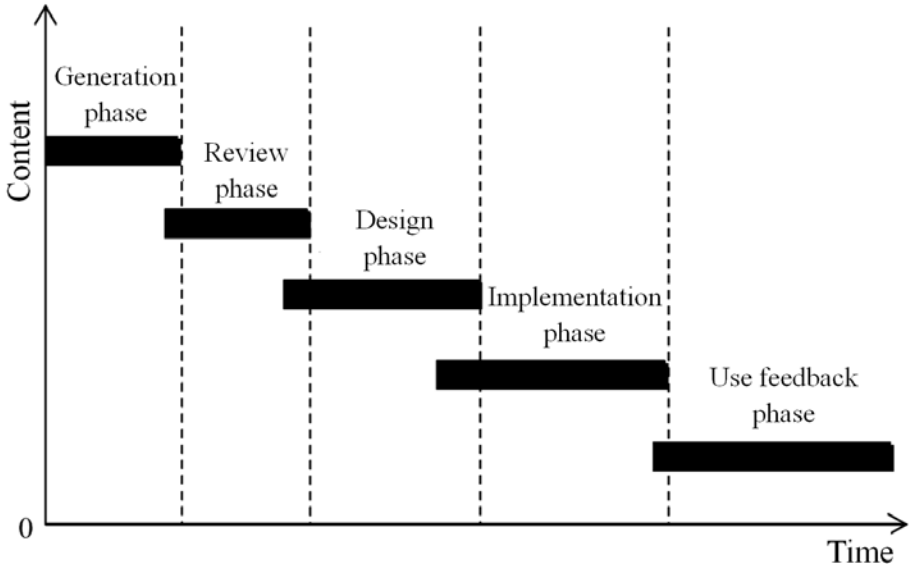

Fig.2 The Relationship in Time between the Various Stages of Enterprise Technological Innovation

Good innovation environment can optimize and integrate the innovation resources in the region, promote the sustainable development of the regional economy, improve the competitiveness of the regional economy, and provide technical support for upgrading the industrial structure in the regional economy. Enterprises in the industry constantly integrate the resources they control, which promotes the rapid development of the scale of advantageous and powerful enterprises, and provides a large number of targeted and needed resources for enterprises to search for new resources and develop new capabilities, thus promoting the gradual improvement of the strength scale and status of the enterprises. From the comprehensive level of technology and economy, independent innovation and high-tech industrialization complement each other. Only when they develop together can they form a synchronous upgrade of technology and industry, and build a benign interactive relationship between economic development and technological upgrading, which can have a positive effect on economic development and technical level improvement. In order to promote the optimization and upgrading of the industry, all resources owned by enterprises in the industry are constantly updated, even if the enterprises' updating ability is gradually enhanced. The resource renewal ability of enterprises in the industry is characterized by the ability to further integrate resources and search and cultivate new resources, and at the same time selectively eliminate resources that hinder and are not conducive to their development, so as to improve the efficiency of industrial innovation.

4. Conclusions

With the rapid development of high-tech industries, the technological innovation activities of

high-tech industries have always played a leading role in the process of industrial development, and the efficiency of technological innovation determines the development direction and trend of technological innovation. Enterprises in the industry take their own resources as production factors, and carry out “new combination” to form a certain technological innovation. Different enterprises carry out different “new combination” of their own resources to form different technological innovations. This paper studies the dynamic capability evolution of technological innovation in China's high-tech industries, and puts forward countermeasures and suggestions to improve the efficiency of technological innovation, which is of theoretical and practical significance to promote the development of China's high-tech industries and economic prosperity. The efficiency of technological innovation of enterprises in the industry is characterized by the further integration of resources and the ability to search and cultivate new resources. At the same time, the resources that hinder and are not conducive to their development are selectively eliminated, which promotes them to form a tangible and intangible resource base consistent with the direction of industrial upgrading. There is a correlation between high-tech industrialization and technology digestion and absorption ability, that is, if the imported technology has strong digestion and absorption ability, the high-tech industry can have higher technological innovation efficiency and provide technical guarantee for the birth and marketization of high-tech new products and processes.

Acknowledgements

(2020A1010020061)/Supported by soft science research program of Guangdong Province(2020A100020061)

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