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THE INTEGRATED DEVELOPMENT MODEL RESEARCH OF SCIENCE AND TECHNOLOGY FINANCE IN HENAN PROVINCE BASED ON THE PERSPECTIVE OF REGIONAL COMPARISON

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ABSTRACT

In order to promote the coordinated development of science and technology (S&T) finance, developed countries and developed regions have made many useful attempts and have formed a unique model of integrated development of S&T finance. In order to narrow the gap between the developed provinces and enhance the innovation ability of scientific technology, Henan Province should find out the problems that exist in the integration of S&T finance on the basis of a systematic study of the model of integrated development of S&T finance in developed regions and build a unique model of integrated development of S&T finance.

Keywords: regional comparison, S&T finance, model of integrated development, status analysis, policy support

INTRODUCTION

According to《the 2017 China Regional Innovation Assessment Report》,the eastern region has the strongest innovation capacity and the central and western regions are weak. The innovation capability of various regions of the country has steadily improved, and a unique regional innovation model has been formed. The integrated development path exploration of S&T finance has become a breakthrough to enhance the ability of science and technology innovation in various regions. Henan province is located at 15th of the 31 provinces. There is still a large gap between the developed provinces on the enterprise innovation, innovation environment and innovation performance. In order to give play to the catch-up effect and late-mover advantage of Henan province in science and technology innovation, It is necessary to have a systematical

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study toward the successful practice of S&T finance integration development in developed countries and provinces, which can provide experience support for improving the ability of science and technology innovation in Henan Province.

This article is divided into four parts. Firstly, it analyzes the successful cases of the integrated development of S&T finance in developed countries and regions. Among them, developed countries are represented by the United States and Japan. Developed regions are represented by Guangdong Province, Jiangsu Province and Beijing City. By means of comparative analysis, we can find out the integrated situation of the S&T finance in Henan Province and analyze the gap. Secondly, to study the main problems in the development of S&T finance in Henan province, such as scientific and technological talents, policy support, the construction of financial system, and the role of coordination mechanism, so as to provide support for the construction of a distinctive model of integrated development of S&T finance. Thirdly, on the basis of summing up the law of development, how to construct the development model of the integration of S&T finance in Henan Province is explored. Finally, it briefly introduces the research conclusions and future research trends, which provides guidance for in-depth research on the integrated development of S&T finance in Henan Province.

1. Successful Practice of the Integrated Development of Science and Technology Finance in Developed Countries and Regions

1.1 Successful Practice of the Integrated Development of Science and Technology Finance in Developed Countries

1.1.1 Integrated Development Model of American Science and Technology Finance

In order to support the development of the science and technology industry, the United States has established a S&T finance support system with a developed venture capital system, a perfect credit guarantee system, and flexible bond issuance. In venture capital systems, start-up and growth companies in new areas such as the IT industry and bioengineering have access to venture capital. The government has made it clear that individuals and companies that can invest in venture capital projects can receive low-interest loans. In the credit guarantee system, the government provides loan guarantees for small and medium-sized enterprises to solve the fundamental problem of enterprise financing difficulties, and provides guarantees for the R&D investment and market development of enterprises. In the bond issuance market, the government has reduced the standards for companies to issue bonds and relaxed the requirements for corporate credit ratings. As long as consensus is reached with securities companies in terms of total issuance terms, etc., companies can issue bonds.

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1.1.2. Integrated Development Model of Japanese Science and Technology Finance

Japan is second only to the United States in its scientific and technological innovation capabilities, and it has made a useful attempt in the path exploration of the integration development of S&T finance. Firstly, Japanese SMEs are mainly based on indirect financing, so Japan has built a huge commercial banking system, mainly including local banks, second local banks, credit vaults, and credit cooperatives. Secondly, the Japanese venture capital market is more developed. As early as 1972, it had established a venture capital fund, which had eased the financing difficulties of SMEs. Thirdly, the Japanese government has adopted more than 50 laws and regulations to protect and promote the scientific and technological development of small and medium-sized enterprises through administrative means. In order to serve SMEs, the Japanese government has set up a small and medium-sized enterprise office. These targeted initiatives support science and technology innovation in SMEs.

1.2 Successful Practice of the Integrated Development of Science and Technology Finance in Developed Regions

Guangdong, Jiangsu and Beijing are the three most innovative regions in China. In the choice of S&T finance integration path, three regions have formed a unique integration development model of S&T finance.

1.2.1 Integrated Development Model of Science and Technology Finance of Guangdong Province

Guangdong province has formed the S&T finance integrated development model of "government guidance + financing channel development + science and technology insurance protection". Guangdong Research and Development Expenditure on investment exceeded 200 billion yuan in 2016, a 11.5% year-on-year growth, ranking first in China; R&D/GDP (investment intensity) also reached a new high of 2.56%. Patent output indicators continued to grow at a high rate. In 2016, 155,600 invention patent applications were filed in the province, an increase of 49.7% year-on-year. The rapid development of the indicators is mainly due to the government's policy guidance. Under the guidance of the government policy, a science and technology innovation fund was set up for the initial stage of small and medium-sized enterprises, and the supervision system for guiding the entry and transfer of funds to and from various stages was improved; Guangdong Province tried to change the financing mode based on indirect financing, broadened the direct financing channels, vigorously launched the new three boards, and vigorously promoted the cultivation of the "new three boards" pilot listing enterprises; For high-tech enterprises, Guangdong Province has established a wide range of

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science and technology insurance, and continuously improve and innovate science and technology insurance products.

1.2.2 Integrated Development Model of Science and Technology Finance of Jiangsu Province

Jiangsu Province has now formed a multi-dimensional S&T finance integration development model of "policy guarantee + Capital support + venture investment + service platform". In terms of policy protection, Jiangsu Province has successively promulgated science and technology credit policies, special funds policies, direct financing policies, science and technology insurance and guarantee policies. In terms of financial support, the total amount and intensity of financial investment in science and technology in Jiangsu Province has always been the highest, and the potential for scientific and technological innovation has gradually been released and the innovation ability has been continuously enhanced. In terms of venture capital, Jiangsu Province has established 34 loan risk compensation pools for science and technology SMEs, with a capital scale of 500 million yuan and 10 cooperative banks. In that year, 5.988 billion yuan of new loans were issued, helping 1,542 science and technology SMEs to solve financing problems. So far, more than 3,000 technology enterprises have been funded.[1] In terms of service platform, Jiangsu Province has built a science and technology innovation platform that integrates public R&D platform, enterprise innovation platform and public service platform. The public R&D platform is based on national and provincial key laboratories. There are 97 key laboratories in the province, of which 28 are national laboratories(including 22 national key laboratories and Co-construction of 4 laboratories by the Ministry of Education and Jiangsu province), 69 are provincial key laboratories. The number of national key laboratories ranks first in the whole provinces; Jiangsu Province relies on the key laboratory of enterprises, enterprise academician work station, and engineering technology research center to build an enterprise innovation platform; As an important part of the public service platform, technology innovation service platform and S&T resource sharing platform play an important role in promoting the development of S&T finance.

1.2.3 Integrated Development Model of Science and Technology Finance of Beijing

Beijing has formed a integrated development model of S&T finance named "credit security + policy support + product innovation". In terms of credit security, Beijing has taken the credit cultivation project for scientific and technical SMEs as its priority, established the first self-regulatory credit organization named the Zhongguancun Enterprise Credit Promotion Association, formulated a credit policy system, established credit service institutions and developed credit service products. The credit information system is constructed. Enterprises with

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relatively high credit ratings enjoy preferential loan policies. In terms of policy support, Beijing has issued targeted policies for different development stages, different industries, and different sizes of technology-based small and medium-sized enterprises. For example, the "Implementation Opinions of the Beijing People's Government on Accelerating the Development of the Capital Science and Technology Service Industry" was issued for the science and technology service industry, and the "Measures for the Management of Credit Risk Compensation Funds for Small and Micro Enterprises in the National Autonomous Innovation Demonstration Area of Zhongguancun" was issued for small and micro enterprises. For Internet financial enterprises, the "Measures on Supporting the Development of the Internet Financial Industry in Zhongguancun" was issued. In terms of S&T finance products innovation, different S&T finance innovation products are introduced for the development stage of enterprises. For seed enterprises, financial products such as policy finance and angel investment funds are launched; For start-up companies, government start-up guidance funds was launched, and selected high-growth technology companies through the market; For growing enterprises, various financing modes such as banking services, venture capital, and equity trading are introduced; For mature enterprises, a variety of financing models such as large and medium-sized bank credit, listing financing, and merger and reorganization are introduced.

2. Status Analysis of Integrated Development on the Science and Technology Finance of Henan Province

Based on the development model of S&T Finance in developed countries, Guangdong Province, Jiangsu Province, Beijing and other developed regions have developed a unique integrated development model of S&T Finance. The ability of integrated development between S&T industry and the financial industry has obviously improved, and the synergy effect has become increasingly prominent which plays an important role in enhancing China's scientific and technological innovation capabilities. Although Henan province has done a great deal of work to promote the integration of S&T finance, there is still a big gap with developed provinces. The main problems are mainly manifested in the following aspects.

2.1 Shortage of Talents in Science and Technology Innovation and the Funding is Insufficient

From a vertical perspective, compared with 2015, the number of research and experimental development personnel and internal expenditure of funds in Henan Province in 2016 have been significantly increased, and the number of patent licenses has also been greatly increased. However, from the perspective of horizontal comparison, there is still a large gap between the number of R&D personnel, the internal expenditure of R&D funds, and the index of patent

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authorization in Henan Province every year compared with the developed regions such as Guangdong Province, Jiangsu Province, and Beijing City.

Jiangsu Province has the largest number of R&D personnel and patent licenses, which is about five times that of Henan Province. This is the fundamental reason why Jiangsu's technological innovation ability can be ranked first in the country for many years. In 2016, Guangdong's R&D internal spending ranked first, four times that of Henan Province, which may be an important reason why Guangdong Province can become the region with the strongest capacity for scientific and technological innovation. The number of R&D personnel has a great relationship with the internal expenditure of funds and the amount of patent authorization. With a small number of R&D personnel, the internal expenditure and patent authorization of R&D will be relatively small. Therefore, the insufficient number of science and technology personnel is an important factor that restricts the current improvement of scientific and technological innovation ability in Henan Province.

Table -1: R&D Personnel、Interal Expenditures on R&D、Number of Patents Applications Granted

Provice	2015(year)			2016(year)		
	R&D Personnel（ten thousand person）	Interal Expenditures on R&D (100 million yuan)	Number of Patents Applications Granted (piece)	R&D Personnel (ten thousand person)	Interal Expenditures on R&D (100 million yuan)	Number of Patents Applications Granted (piece)
Henan	24.12	435.04	4740	24.99	494.19	6881
Guangdong	68.02	1798.17	241176	73.52	2035.14	259032
Jiangsu	111.99	1801.23	250290	117	2026.87	231033
Beijing	74.75	1384.02	94031	81.02	1484.58	100578

2.2 Poor Implementation of Science and Technology Finance Policy

As can be seen from the pattern of integrated development of S&T finance in developed countries such as the United States and Japan, and in developed regions such as Guangdong, Jiangsu and Beijing, government policies play an important role in promoting integrated development of S&T finance. In order to give full play to the late development advantages of Henan Province, on July 10, 2017, the Henan Science and Technology Department issued the “Special Action Plan for the Deep Integration of S&T Finance in Henan Province”, which plans to cultivate and expand the venture investment market, promote the development of science and

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technology credit business, and set up S&T finance service system that will stimulate the internal impetus of financial capital and social capital to support scientific and technological innovation, deepen scientific and technological financial products and services innovation, and explore new models of financial services that meet the conditions of Henan Province and are suitable for the development of scientific and technological enterprises.

In terms of policy time, compared with developed regions, the time lags, which is the main reason for the large gap between Henan Province and developed regions. In terms of the effectiveness of policy implementation, the process is not very satisfactory. The "Special Action Plan" is a macro guiding program document, but it still lacks operational policy support for details such as how to innovate science and technology credit products, promote science and technology insurance business, and set up new science and technology financial franchises. Some regions, such as Xuchang City, have used research methods to try to carry out financial activities such as "science and technology insurance" and "science and technology lending", which can put forward certain experience support for the subsequent policies.

2.3 Multi-level Market System of Science and Technology Finance to Be Constructed

The market system of S&T finance refers to the sum of interdependent and interconnected markets that can promote the coordinated development of S&T finance, including the science and technology guarantee system, the science and technology banking system, the venture capital system, and the S&T finance service platform system. The science and technology guarantee system is not yet perfect. S&T enterprises mainly obtain funds through commercial guarantees, and the forms of policy guarantees and mutual aid guarantees supported by government policies need to be discovered. The pace of construction of S&T banking system is relatively slow.

In October 2016, the Henan Science and Technology Department and Zhengzhou Bank signed a strategic cooperation agreement on S&T finance. On April 11, 2018, China Construction Bank established the first science and technology sub-branch in Zhengzhou. Although late, an important step has been taken; The role of the venture capital system needs to be strengthened.

The venture capital of Henan province started late, but developed rapidly, there were some outstanding problems such as shortage of talents, excessive government intervention and weak concept of venture capital, and the cost of financing of small and medium-sized enterprises through venture capital was high; The development of S&T finance service platform system is lagging behind. The service platform system includes not only the service platform that connects the two major sectors of technology and finance, but also the technology service platform for technology companies established by traditional financial institutions, venture capital

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institutions, and securities trading markets. Although Henan has built the "S&T Finance online service platform", the number of institutional service platforms is still relatively small. On the whole, the market system of S&T finance in Henan Province can not provide a market-driven capital guarantee system for the integration of technology and finance.

2.4 Coordination Role of Science and Technology Finance to Be Played

The development path of S&T finance in Guangdong province, Jiangsu province, Beijing and other regions has a common feature: it places too much emphasis on financial support for S&T enterprises, and ignores the impact of scientific and technological progress on financial product innovation. The strength of the S&T finance system depends on the synergy of them. Financial institutions must not only provide financial support for scientific and technological enterprises, but also innovate financial products according to the characteristics of the capital needs of scientific and technological enterprises, so as to meet the different needs of different enterprises at different stages of development and of different sizes. The interaction between the two is a spiral upward process. As a province with poor ability of scientific and technological innovation but good growth prospects, Henan province should try its best to avoid the problems encountered in developed regions and give full play to its late-development advantages. Looking at the international situation, the Sino-U.S. trade war has become more and more intense, and ZTE has been sanctioned by the United States. The basic research ability is poor, and the low level of core technology is the root cause of this incident. In response to the changes in the international situation, Henan province should innovate financial instruments, focus on supporting high-tech industries, and make due contributions to powerful national industries.

3. Research on the Integrated Development Model of Science and Technology Finance in Henan Province

On the basis of fully studying its own problems, Henan province should draw lessons from the successful practice of the integrated development model of S&T finance in developed regions and take a unique model of "talent introduction + policy support + market allocation + credit evaluation".

3.1 Implement Provincial Strategy for Strengthening Talent and Increase Research Funding Support

Henan province has five major national strategies, including the core grain production area, the central economic zone of the central plains, Zhengzhou Airport Economy Zone, Zheng-luo-xin National Innovation Demonstration Area, and the Henan Free Trade Area, that have some appeal

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in terms of talent introduction, but without preferential policy support, It may not be able to recruit the required talents. Talent is the “lubricant” that can make the two major fields of S＆T finance develop coordinately. At present, Shanghai, Jiangsu, Guangzhou and other regions have formulated targeted measures to introduce high-level talents. In order to win the competition for talents, Henan Province must introduce extraordinary measures that can increase financial support for researchers, relax the conditions for them to settle down, and provide certain subsidies for them to purchase housing. The “one person, one strategy” strategy can be adopted for the talents engaged in basic research in the high-tech field. In addition, while introducing talents, we should effectively safeguard the interests of existing talents and prevent talents from fleeing.

3.2 Strengthen Policy Support and Stimulate the Enterprises Vitality of Science and Technology Finance

Constructing a multi-dimensional and full-coverage policy system is the basic guarantee for promoting the coordinated development of S＆T finance, and strengthening the breadth and strength of policy support will help reduce the market risks faced by S＆T finance companies and stimulate the impetus and vitality of innovation of S＆T finance companies. On the one hand, different policy support strategies should be adopted to different technological enterprises at different innovation stages and of different scale to reduce the financing cost of technological enterprises. For financial institutions that can provide financial support to scientific and technological enterprises, we should put in place targeted guidance policies, provide some support for financial instrument innovation, and reduce the risk of financial institutions lending. On the other hand, the government should introduce incentive policies to promote the rapid and healthy development of the service institutions and platforms that serve the coordinated development of S＆T finance

3.3 Build Science and Technology Finance System and Give Play to the Basic Role of Market Mechanisms

The decisive role of the market mechanism in allocating resources depends on the perfect market system. It is an important task to build the interactive S＆T guarantee system, S＆T banking system, venture capital system, and S＆T finance service platform system. In order to give full play to the role of the science and technology guarantee system, the government can work from the establishment of guarantee funds, the establishment of leading science and technology guarantee enterprises, and the innovation of science and technology guarantee models. In order to give full play to the basic role of the science and technology banking system, the government

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should speed up the establishment of science and technology banks, and build service banks of different nature for science and technology enterprises of different sizes and stages; In order to give full play to the role of venture capital in driving the national economy, in addition to continuing to increase the leading role of government financial funds, we should also give full play to the supplementary role of surplus funds of residents, non-public enterprises, banks and non-bank financial institutions. In addition, the establishment of venture capital intermediary institutions and the introduction of venture capital talent is also an important task; In order to give full play to the service functions of the S&T finance platform system, the Henan provincial government should focus on building a unified and authoritative main service platform, which is a distribution center for financing information and providing information on capital units for technology-based enterprises. On this main service platform, financial institutions and financing enterprises should focus on building service platforms to share information between capital supply and demand.

3.4 Build up Credit Evaluation System to Reduce Financing Cost of Technology Enterprises

A perfect credit appraisal system can not only reduce the evaluation cost of banks, but also reduce the financing cost of technology companies. Compared with developed regions, the construction of credit evaluation system in Henan province has been advancing steadily. The government should actively guide and cultivate a number of science and technology assessment institutions, evaluation firms, credit rating companies and other institutions with good credit, which are encouraged to publish untrustworthy records from time to time, increasing the cost of breach of trust. For small and medium-sized technology enterprises, the government may entrust the authority to design the index system of the credit evaluation of the enterprises, and comprehensively use the methods of quantitative evaluation, qualitative evaluation and comprehensive evaluation to give the scientific and technological enterprises an objective and true evaluation. Financial institutions can use the final credit rating score of the company as a judgment criterion for granting loans to technology companies.

Conclusion and Directions for Future Research

The integrated development model of S&T finance in Henan province provides a new research perspective for the coordinated development of S&T industry and financial industry. Under the interaction of talents, funds, policies, and system construction, the ability of S&T innovation in Henan Province will be steadily improved, and it will be able to give full play to the late-moveradvantage and reduce the gap between developed regions.

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The research uses normative analysis method to focus on the problems and countermeasures in the integrated development of S&T finance in Henan Province. Quantitative research and influence mechanism on the impact of talents, policies, and funds on S&T finance in Henan Province is an important research direction. In addition, the construction of credit evaluation system and technology financial service system for local provinces is also an important research issue.

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