

The Input-output Status and Efficiency Analysis of Science and Technology Finance in Liaoning Province

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Abstract: The efficient integration of high-tech and financial industry is a key engine to promote regional economic, social transformation and upgrade, as well as to realize the strategy of innovation-driven growth. Liaoning Province is in the critical period of economic transition. It is an important guarantee and inevitable choice to carry out science and technology finance, which further enhances independent innovation ability, actively integrates regional resources and continuously expands the scale of the province. Therefore, this paper analyses the input-output status of science and technology finance in Liaoning Province based on DEA-Malmquist index model and carries out an empirical study. Furthermore, an evaluation of the input-output status of science and technology finance in Liaoning province is proposed from perspectives of comprehensive benefit, technical benefit and scale benefit. Finally, specific suggestions for improving the input-output efficiency are put forward in terms of government functions, scientific research achievements transformation efficiency and talent cultivation.

1. Introduction

Under the background of the deep integration of global high-tech enterprises and digital technologies, new technologies such as big data analysis, artificial intelligence and block chain have reshaped the boundaries of the financial discipline [1]. These technologies result in great changes in the production mode, organizational form and international competition management mode of the global financial industry.

Current development of China has changed from high-speed to high-quality development, the economy has entered a 'new routine', and it is critical to optimize and upgrade the economic structure [2]. Science and technology innovation is an important source of power to promote local economic and social development, and the optimization of the national economic structure and the high-quality advancement of the economy cannot do without the support of the nation for science and technology innovation. In other side, the economic advancement also promotes the development of science and technology innovation [3]. The organic integration between science and technology and finance is an inevitable need to promote the marketization of technology

development and scientific achievements and enhance the vitality of technological innovation of small and medium-sized enterprises. It is also a key point to promote the optimization and upgrade of economic structure in the era of ‘innovation-driven economic development’ [4]. In the face of the new situation, the People's Bank of China points out in the ‘Fintech Development Plan (2019-2021)’ that science and technology innovation should be intensified to promote the deep integration and coordinated development of financial technology, and promote Chinese financial science to be forefront of the world. According to ‘The 14th Five-Year Plan for National Economy and Community Development of Shenyang and the Overall Goal of 2035 Vision’, it is necessary to insist the national innovation-driven strategy, enhance core competitiveness, further implement the national strategy of strengthening provinces through science , education and human resources, and contribute Liaoning intelligence to build a high-level innovative city in China [5].

The science and technology in Liaoning Province has continuously and healthily developed in recent years. But it still faces some problems such as consolidating the basic advantages of technology innovation, completing the ecological environment of technology innovation, and the support and driving effect of technology innovation on economic development is still not obvious [6]. This paper systematically describes the development status and changing trend of science and technology finance in Liaoning Province and explains the mutual promotion relationship between financial services and science and technology innovation. Then, it analyzes the important factors affecting the input-output efficiency of science and technology finance, establishes relevant models, and carries out empirical analysis based on sample data. Finally, it summarizes the key problems that restrict the improvement of the input-output efficiency of science and technology finance in Liaoning Province, and further discusses the path to improve the development of science and technology finance, which is of great significance for accelerating the construction of innovation system in Liaoning Province and promoting the construction of high-level and high-quality innovative province.

2. Connotation of Science and Technology Finance and Input-output Efficiency

2.1. Connotation of Science and Technology Finance

Science and technology finance is the primary productive force for science and technology progress and development, as well as the mechanism arrangement for various financial instruments, systems, policies and services [7]. Science and technology financial service system is a collection of science and technology financial service providers, service providers, service intermediary organizations, science and technology financial services of government, ecological protection and other service requirements. The demand for science and technology financial services includes high-tech industry, institutions of higher learning, scientific research institutions, government departments and individuals. Its capital supply includes government departments, financial institutions, high-tech companies, science and technology insurance institutions, technology investment markets and so on [8]. In the Science and technology financial system, the government is not only the service provider and middleman, but also the guide and regulator.

2.2. Input-output Efficiency of Science and Technology Finance

2.2.1. Connotation of Input-output Efficiency

Input-output efficiency is the productivity level that national economic department can reach under certain resource input conditions. It describes how to minimize the investment under limited production conditions or maximize the utilization of resources under established investment through

rational resource allocation, so as to reach the best state of Pareto optimization frontier. From the micro perspective, input-output efficiency refers to how enterprises efficiently utilize the limited technological and financial innovation resources in the field of science and technology finance. From the macro perspective, input-output efficiency refers to the rational allocation of limited science and technology innovation resources by enterprises. Although input-output efficiency is a static index, once the construction period and operational life cycle of project are known, its internal rate of return can be linked to the financial gain of investment [9].

2.2.2. Measurement Method

Common methods to measure the input-output efficiency of science and technology finance include system theory, multi-objective analytic hierarchy process, factor analysis, multi-factor analysis, cluster analysis, fuzzy comprehensive evaluation method using fuzzy mathematics theory, big data envelopment analysis and so on [10]. The data envelopment analysis method based on the DEA-Malmquist index is chosen in this paper to study the input and output efficiency of science and technology finance in Liaoning Province.

The yield index created by the distance to function ratio is used in DEA-Malmquist index analysis to reflect changes in total factor yield (TFP). The DEA-Malmquist index is developed on the foundation of the big data envelopment model, which is frequently used in the study of government investment and productivity. Similar to the traditional DEA model, the static DEA model ignores the time sequence change of the decision unit flow over time and instead focuses on the change of the decision unit at the same node. However, the Malmquist index analysis method focuses on the phenomenon that the time sequence of the decision unit changes. This method also takes the influence brought about by the change of output technology and technology effectiveness into account while studying the time-varying properties of output efficiency. The linear distance ratio between the production input and output vector collected is used as the starting point for the DEA-Malmquist index analysis method. On the basis, the distance ratio between a fixed point in the production front and other data points is calculated, and the variation of total factor production of the two data points are estimated.

3. Analysis on Influencing Factors of Input-output Efficiency of Science and Technology Finance in Liaoning Province

3.1. The Characteristics of Science and Technology Finance in China

3.1.1. Scarce Talents Related to Science and Technology Finance

The financial industry is intensive in talents and intelligence. Talent is the primary driving force to promote the innovation of science and technology finance. To ensure the continued success of financial technology, talent development, reserve and supply are crucial requirements. At present, most financial talents in China are still engaged in traditional financial business, lacking the ability to identify and estimate the risk of science and technology innovation, which restricts the further development of the field of science and technology finance in China.

3.1.2. Insufficient Innovation in Science and Technology Finance

The mainly financial business in China is traditional with the lack of innovative financial products. According to the development of Chinese fund industry, asset securitization industry and securities industry, Chinese finance industry still has huge development space. Due to the lack of innovation capability, enterprises are unable to access the financial services they require, which

impacts the development of enterprises and further restricts the advancement of innovation capability on science and technology finance.

3.1.3. Low Degree of Integration between Research Institutions and Research Enterprises

From the perspective of technology innovation subjects, relationships between scientific research institutions and enterprises and between manufacturing and scientific research are not close, limiting the advancement of science and technology innovation. Early on, the main work of R&D institutions is research. In recent years, these institutions have expanded gradually into the industrial sector, leading to the closeness of R&D institutions and businesses. However, due to the insufficient understanding of R&D institutions on the actual needs of small and medium sized enterprises, some science and technology research has not been transformed into the actual productive forces, which hinders the development of the overall research in China.

3.2. Current Input-output Status of Science and Technology Finance in Liaoning Province

Liaoning Province is a significant old industrial base in Northeast China. Under this circumstance, we should actively respond to the call of the country, including accelerating the development of science, technology and finance, and vigorously support the upgrading science and technology finance level.

3.2.1. Investment in Science and Technology Finance

1) Fiscal expenditure on science and technology

Fiscal expenditure on science and technology refers to the funds invested by the government and relevant departments to support science and technology activities. It is usually referred to the funds for scientific research projects in the national budget. Figure 1 shows the fiscal expenditure on science and technology in Liaoning Province from 2016 to 2020.

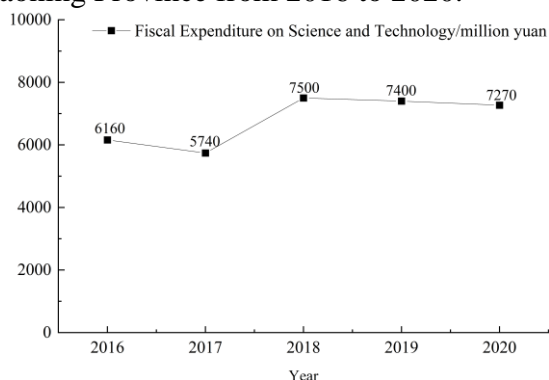


Figure 1: Fiscal expenditure on science and technology in Liaoning Province from 2016 to 2020

In Figure 1, the fiscal expenditure on science and technology decreases at the beginning and then increases. In the later period, it fell back to a certain extent. In general, the overall gap is not high and the fiscal expenditure is stable at more than 7 billion. The scale of fiscal expenditure on science and technology in Liaoning Province is large, showing a steady trend of improvement.

2) Loans of science and technology institutions

Loans of science and technology financial institutions refer to loans provided by various science and technology institutions and companies for the transfer of new technologies, new products and science and technology achievements to product. The objects of loans cover industrial enterprises, rural companies, commercial enterprises, high and new technology enterprises, private enterprises, etc. According to the 2021 communique of Liaoning Provincial Finance Bureau, the amount of

loans issued by science and technology institutions in Liaoning in recent years is nearly 3.847 billion yuan. At the same time, the financial regulatory Bureau of Liaoning Province said that it will issue guidelines on deepening science and technology financial services. They will cooperate with financial institutions such as China Development Bank and propose measure such as jointly develop low-interest science and technology credit, capital pool and loan discount. Moreover, they will accurately select high-growth science and technology enterprises and institutions, continue to carry out listing cultivation, implement the award and subsidy policy and do a good job in the full cycle service. Guide enterprises in lending and financing and help science and technology start-ups solve the problem of short or medium-term capital shortage.

3) Internal expenditure of R&D

The internal expenditure of R&D is the actual expenditure of the research activities carried out by companies. The main research activities include basic research, applied research and experimental development. The internal expenditure of R&D includes direct expenses of R&D activities, administrative expenses, related capital construction expenses and external processing expenses. In Figure 2, the overall R&D expenditure of Liaoning Province from 2013 to 2020 shows a decreasing trend at the beginning, and then an increasing trend. The internal expenditure of R&D shows increasing, decreasing and increasing trends successively. By 2020, the internal R&D expenditure has reached 46 billion yuan.

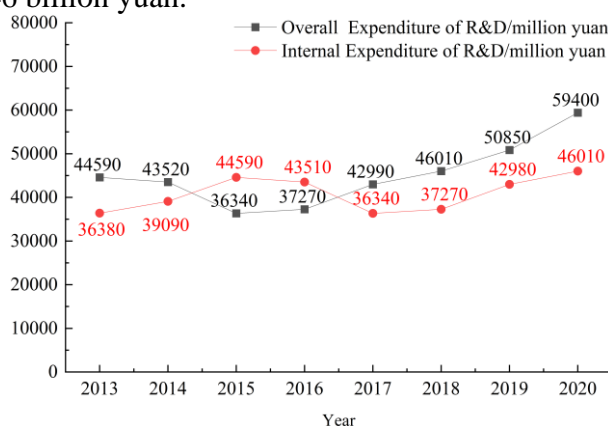


Figure 2: R&D expenditure of Liaoning Province from 2013 to 2020

In recent years, in order to implement the national strategy of innovation-driven development and further guarantee the increase in research investment in small and medium enterprises, the rules for the implementation and administration of R&D project funds and post-investment subsidies for small and medium sized enterprises are proposed by science and technology agency, department of finance and statistics bureau of Liaoning Province. Those steps are proposed in accordance with the Temporary Rules for the Administration of Subsidies After Key Special Funds in the Provincial Science and Technology Planning (Provincial Finance and Education [2017] No. 602).

3.2.2. Science and Technology Finance Output

1) Number of granted patents

The number of authorized patents refers to the number of patents that the patent administration organ grants, issues patent certificates and announces related matters in the reporting year when there is no objection or rejection to the applied patents. Liaoning Province is actively building a ‘big protection’ mode, fully mobilizing the creativity of various market players and promoting the growth of various economic indicators. In Figure 3, the number of patent applications and authorization both increase steadily. Besides, the proportion of authorization shows a decreasing trend at first, and then an increasing trend. In recent years, there are 3 national intellectual property

protection centers in Liaoning Province being listed by CNIPA as the second batch of national pilot projects for demonstration construction of administrative adjudication of patent tort disputes. Liaoning Province intensifies the investigation and punishment of tort, counterfeit and illegal acts and investigates and handles 331 cases of various intellectual property tort throughout the year. Liaoning Province won the fourth place in the 22nd China Patent Award, which is the best in the past years.

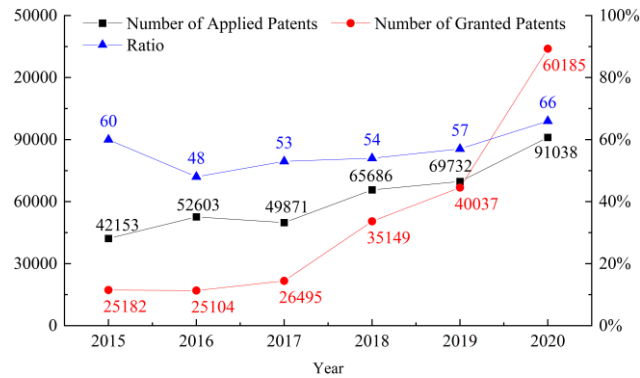


Figure 3: Status of patent authorization from 2015 to 2020

2) Technology market turnover

Contract transactions in the technology market includes technology development, technology transfer and information technology consulting services. Technology contract refers to a contract between two parties concerning technology development, transfer, consultation and service. It defines the rights and obligations of both parties. In recent years, in order to promote the transformation of scientific and technological achievements, Liaoning Province strengthens the docking and matching of science and technology achievements and actively provides a platform for exchanges between enterprises and colleges and universities. A local matching meeting of the science and technology institutions of CAS is held in Liaoning, and 175 projects with a combined investment of 205.5 million yuan are signed. Figure 4 depicts the technology market turnover of Liaoning Province from 2013 to 2020. By 2020, this turnover increases significantly to reach 64.51 billion yuan.

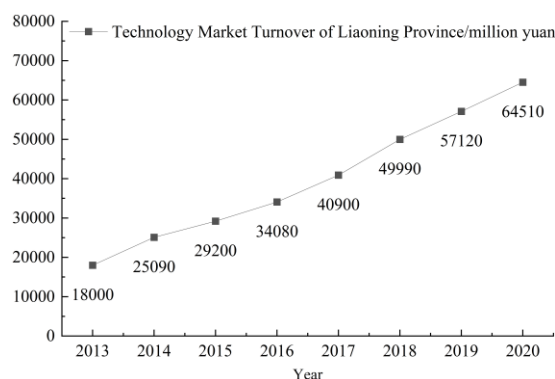


Figure 4: Technology market turnover of Liaoning Province from 2013 to 2020

3) Sales revenue of new products in high-tech industries

The sales revenue of new products in high-tech industries refers to the sales revenue generated by new products declared in those industries. High-tech industry is group represented by modern science and technology, biological engineering and new materials, which has the characteristics of rapid development and strong permeability. According to statistics, the sales revenue of new products of high-tech enterprises in Liaoning Province reaches 444 billion yuan in 2020, with an

increase of 13.6 percent in 2021.

3.3. Empirical Analysis of Influencing Factors of Science and Technology Financial Input-output Efficiency in Liaoning Province

3.3.1. Variable Selection

When evaluating the input-output benefit of science and technology finance, the chosen assessment factors not only reflect the actual situation of investment and production, but also take into account the characteristics of the DEA method itself. The investment projects selected in this paper include fiscal expenditure on science and technology, loans to science and technology institutions and internal expenditure of R&D funds. The selected output projects of science and technology finance mainly include the amount of patent authorization, the turnover of technology market and the sales of high-tech new products, as shown in Table 1.

Table 1: Input-output indexes of science and technology finance

Category	index
Input index	Fiscal government expenditure on science and technology
	Loans to science and technology institutions
	Internal expenditure of R&D funds
Output index	Amount of patent authorization
	Turnover of technology market
	Sales of high-tech new products

3.3.2. System Model of Influencing Factors

The science and technology finance input-output index data of 31 provinces, cities, and administrative regions in 2020 is inputted via DEAP2.1 software. Based on this, the overall performance level of Liaoning Province in the entire nation is analyzed. The comprehensive efficiency, pure technical efficiency, and scale efficiency of the province's science and technology finance input-output in 2020 are calculated, as shown in Table 2. In Table 2, crste, vrste, scale, drs, irs and '-' mean the comprehensive efficiency, pure technical efficiency, scale efficiency, reduced size, increased size and unchanged size, respectively.

Table 2: Test results of national science and technology financial input-output efficiency in 2020

area	crste	vrste	scale		area	crste	vrste	scale	
Beijing	1.000	1.000	1.000	-	Hubei	0.662	0.677	0.977	drs
Tianjin	0.976	0.981	0.995	drs	Hunan	0.640	0.649	0.987	drs
Hebei	1.000	1.000	1.000	-	Guangdong	1.000	1.000	1.000	-
Shanxi	0.780	0.805	0.969	drs	Guangxi	1.000	1.000	1.000	-
Inner Mongolia	0.855	0.879	0.973	irs	Hainan	0.459	0.499	0.920	irs
Liaoning	0.981	0.994	0.987	drs	Chongqing	1.000	1.000	1.000	-
Jilin	1.000	1.000	1.000	-	Sichuan	0.787	0.804	0.980	drs
Heilongjiang	1.000	1.000	1.000	-	Guizhou	0.469	0.515	0.909	drs
Shanghai	0.507	0.602	0.841	drs	Yunnan	0.881	0.923	0.955	drs
Jiangsu	1.000	1.000	1.000	-	Tibet	0.757	1.000	0.757	irs
Zhejiang	0.990	1.000	0.990	drs	Shaanxi	1.000	1.000	1.000	-
Anhui	0.633	0.661	0.957	drs	Gansu	0.960	1.000	0.960	irs
Fujian	1.000	1.000	1.000	-	Qinghai	1.000	1.000	1.000	-
Jiangxi	0.870	0.871	0.999	drs	Ningxia	0.562	0.571	0.984	irs
Shandong	0.883	1.000	0.883	drs	Xinjiang	1.000	1.000	1.000	-
Henan	1.000	1.000	1.000	-	mean	0.860	0.885	0.969	

In Table 2, there are 13 provinces in China with decreasing input-output scale efficiency in 2020.

The input-output efficiency of 13 provinces are fixed. Only 5 provinces show an increase. This phenomenon results from the poor overall level of input-output economies of scale in 2020 in Chinese science and technology financial services due to macroeconomic shocks, epidemics and other factors. Additionally, the mean benefit of science and technology financial services input-output in 31 provinces is 0.860, which belongs to the weakly efficient situation of DEA. A comprehensive analysis reveals that only 13 regions have the comprehensive benefit, technical benefit and scale benefit through DEA. For those regions, with the remaining constant returns to scale under the current science and technology status, the total output will increase as the same rate as all inputs increase. In the other provincial administrative departments, although the numbers of input and output efficiency of science and technology finance are both lower than 1, the influence area of their efficiency are too large to be directly defined.

In 2020, the comprehensive benefit of DEA value in Liaoning is 0.981, the technical benefit is 0.984 and the scale benefit is 0.987. All of them are relatively efficient and reach the middle and upper level. Due to internal management levels and organizational discord, the output has increased at a lower rate than investment, leading to a decreasing trend for the scale benefit.

3.3.3. Case Analysis

1) Comprehensive efficiency analysis

The input and output data of the science and technology financial services of 14 prefecture-level cities in Liaoning during the years 2015 to 2020 are entered into the DEAP2.1 software. The summary effect, pure science and technology effect and scale benefit of the science and technology financial services of county-level cities in Liaoning are calculated. The results are shown in Table 3.

Table 3: Test results of science and technology financial input-output efficiency in prefecture-level cities of Liaoning Province from 2015 to 2020

area	crste	vrste	scale		area	crste	vrste	scale	
Shenyang	1.000	1.000	1.000	-	Fuxin	1.000	1.000	1.000	-
Dalian	0.673	0.721	0.934	drs	Liaoyang	0.588	0.781	0.753	drs
Anshan	1.000	1.000	1.000	-	Panjin	0.583	0.768	0.759	drs
Fushun	0.943	1.000	0.943	drs	Tieling	0.781	1.000	0.781	irs
Benxi	0.550	0.743	0.739	irs	Chaoyang	0.935	1.000	0.935	irs
Dandong	1.000	1.000	1.000	-	Huludao	0.430	0.530	0.811	drs
Jinzhou	0.737	1.000	0.737	drs	mean	0.801	0.896	0.885	
Yingkou	1.000	1.000	1.000	-					

Comprehensive technical efficiency is the reflection and evaluation of decision unit's resource allocation ability, resource utilization efficiency and so on. If the comprehensive technical efficiency reaches 1, the resource input and output of the decision unit is optimal. It ensures the technical effectiveness and the rationality of production scale.

In Table 3, there are great differences in the development efficiency of prefecture-level cities in Liaoning Province. The mean comprehensive efficiency value of the province is 0.801, indicating weakly efficient DEA. Among them, the comprehensive efficiency values of Shenyang, Anshan, Dandong, Yingkou and Fuxin are all 1, indicating that DEA is efficient. The values of Fushun and Chaoyang are 0.943 and 0.935, respectively, indicating that DEA is relatively efficient. The efficiency of the remaining cities is less than 0.9, indicating that DEA is weakly efficient. The comprehensive efficiency values of Benxi and Liaoyang are 0.55 and 0.588 respectively, while that of Huludao is 0.430, showing a serious efficiency problem.

2) Technical efficiency analysis

The input and output index data of science and technology finance of 14 prefecture-level cities in

Liaoning Province from 2015 to 2020 are input into DEAP2.1 software. The time series and spatial dynamic index of total factor productivity change and distribution in Liaoning prefecture-level cities are calculated by DEA-Malmquist model, as shown in Table 4. In Table 4, effch, techch, pech, sech and tfpch mean the change of comprehensive science and technology efficiency, technical efficiency, pure technology efficiency, scale efficiency and total factor productivity, respectively.

Table 4: Malmquist index decomposition of prefecture-level cities in Liaoning Province from 2015 to 2020

area	effch	techch	pech	sech	tfpch	area	effch	techch	pech	sech	tfpch
Shenyang	0.573	0.362	1.000	0.573	0.208	Fuxin	0.726	1.449	1.000	0.726	1.051
Dalian	1.278	0.807	1.336	0.956	1.031	Liaoyang	0.639	1.720	0.860	0.742	1.098
Anshan	0.918	1.318	1.000	0.918	1.210	Panjin	0.273	1.715	0.300	0.911	0.469
Fushun	0.644	1.592	0.652	0.988	1.026	Tieling	1.312	1.086	1.000	1.312	1.425
Benxi	1.698	1.582	1.000	1.698	2.686	Chaoyang	1.104	1.867	1.167	0.946	2.062
Dandong	1.000	1.343	1.000	1.000	1.343	Huludao	0.409	1.520	1.278	0.320	0.621
Jinzhou	1.904	1.055	1.592	1.196	2.008	mean	0.866	1.260	0.975	0.889	1.092
Yingkou	1.277	1.405	1.312	0.974	1.794						

In Table 4, the change value of comprehensive science and technology efficiency of prefecture-level cities in Liaoning Province is 0.866, indicating weak DEA efficiency. The technical change value is 1.260, indicating that DEA is efficient. The change value of pure technical efficiency is 0.975, indicating that DEA is relatively efficient and the overall efficiency level develops well, but there is still some room for improvement.

In Liaoning Province, the change value of comprehensive science and technology efficiency in Jinzhou is the highest, which is 1.904. The highest technology change value is 1.867 in Chaoyang. The change value of pure technical efficiency is the highest in Jinzhou, with a value of 1.592. Overall, the development level of technical efficiency in Jinzhou is the best. In addition, the technical efficiency values of Benxi, Dandong, Jinzhou and Tieling reach 1 and above, which is also relatively high. The value of Panjin is mostly below 0.5, the comprehensive efficiency value is 0.273, which needs to be greatly improved. In other urban areas, the overall value keeps floating around 1, with occasionally low value, indicating that there is space for improvement in the development of technical efficiency.

3) Scale efficiency analysis

In Table 3, the mean scale efficiency of prefecture-level cities in Liaoning Province is 0.885, indicating weak and efficient DEA. The values of Shenyang, Anshan, Dandong, Yingkou and Fuxin all reach 1, indicating good scale development. The value of Jinzhou is relatively low at 0.737, which is not efficient in DEA. The overall scale of Benxi, Chaoyang and Tieling is in a state of increasing, while Dalian, Fushun, Jinzhou, Liaoyang, Panjin and Huludao are in a state of decreasing scale, which needs to be adjusted as soon as possible. Other urban areas remain stable.

In Table 4, the change value of average scale efficiency of prefecture-level cities in Liaoning Province is 0.889, indicating weak DEA efficiency. The change value of scale efficiency in Benxi, Dandong, Jinzhou and Tieling is above 1, and the change is large. According to the previous model and data, Benxi, Dandong and Tieling belong to the positive change, while Jinzhou belongs to the negative change direction, which needs to change to the positive direction as soon as possible.

4) Input-output characteristics of science and technology finance in Liaoning Province

According to the above analysis, it can be found that the input-output efficiency of science and technology finance in Liaoning Province is low. In 2020, the comprehensive efficiency, pure technical efficiency and scale efficiency of Liaoning Province are all relatively efficient with DEA, which is in the middle of the national level. However, due to the insufficient fusion of science,

technology and finance, overall development of Liaoning province exhibits a declining trend and is still at a low level. From the perspective of time series change, the technical efficiency of science and technology finance in Liaoning Province is very high and the development momentum is very good, but the input, output efficiency and economies of scale are at a low level. This indicates that although Liaoning Province is investing more money in science and technology finance, there are still some issues with technology management level, transformation level of scientific and technological achievements and utilization rate of funds, which requires scientific planning to improve input-output efficiency.

There are obvious regional differences in input-output efficiency of science and technology finance in Liaoning Province. The input of Shenyang and Dalian is far more than that of the other 12 prefecture-level cities, but the output efficiency is lower than that of Anshan, Yingkou and Dandong, which have less input resources. It indicates that the input resources are excessive and the input-output integration degree is not high. However, the resource input of Liaoyang and Huludao is at the bottom of the province, and the output is insufficient. Under this circumstance, the supply should be increased appropriately.

In Liaoning Province, there is a risk of efficiency redundancy in the input-output of science and technology finance. According to the utility principle of the DEA model, with an increase in investment scale and difficult-to-match output, there is a risk of redundancy, which leads to a gradual decline in the return to scale of enterprise. Although input scale of Liaoning Province increases yearly, the model reveals that the scale efficiency of prefecture-level cities is largely fixed and declining. There will be a significant risk of redundancy if the growth rate of the subsequent output scale cannot keep pace with the current input situation.

4. Conclusion

Based on the DEA-Malmquist index model, this paper analyses the input-output status of science and technology finance in Liaoning Province and carries out empirical studies. The conclusive suggestions are put forward as follow:

1) Give full play to government functions and conduct macro-control

Government should fundamentally solve the weak and prominent problems in scientific development, including strengthening the macro-coordination of science, perfecting the mechanism of scientific decision-making and scientific major policies. On the one hand, we should improve the communication and cooperation mechanism between the central government and various localities, between concerned scientific department, and between scientific institutions and other administrative departments. On the other, we should improve the management system of scientific research funds, establish a competitive and stable research funding system, strengthen the supervision of research projects, and establish a scientific accountability mechanism.

2) Improve the conversion rate of science and technology achievements

First, arouse the enthusiasm of enterprises for the transformation of science and technology achievements. We should guide enterprises to form joint and new-type research organizations with institutions of higher learning and research institutions, and jointly promote the transformation of science and technology. Secondly, attach importance to the intermediate institutions for the transfer of science and technology achievements and give full play to their communication and coordination functions. Therefore, enterprises and universities are able to take what they need easily, leading to an improvement on work efficiency.

3) Focus on cultivating science and technology enterprises and talents

Science and technology enterprises are the backbone of high-quality development and the force behind market growth and vitality. The investment of science and technology should be vigorously

promoted to strengthen financial support. Pilot projects for transforming scientific and technological achievements and incubation centers for science and technology enterprises should also be highly developed. At the same time, expand the talent resource sharing platform, further improve the talent introduction mechanism and regularly evaluate the demand for talents in high-tech enterprises. Encourage university researchers and overseas talents to start their own businesses. Reduce the living costs of talents, expand the supply of public rental housing and talents' apartments, and implement a housing system of 'equal rental and sales rights' to reduce their research burden.

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