Research on the Mechanism and Path of Deepening Regional Collaborative Innovation in Colleges and Universities Taking Ningbo as an Example

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Abstract. Collaborative innovation has always been an important part of the national innovation system, which is of great significance to promote the development of science and technology, economy and education, as well as to build an innovative country. Currently, Ningbo universities and enterprises, scientific research institutes, government and other organizations have achieved positive results in collaborative innovation, but there are still some deficiencies. Therefore, this paper puts forward the mechanism design of resource coordination, benefit coordination and management coordination for deepening regional collaborative innovation in colleges and universities, and improves the effectiveness of the coordination mechanism by increasing investment, consolidating the innovative foundation, scientifically distributing benefits, strengthening evaluation feedback and enhancing the collaborative environment.

1. Introduction

Since the 19th National Congress of CPC, the state has issued a series of policies to encourage collaborative innovation. In March 2018, Premier Li Keqiang proposed in the government work report that we should strengthen the construction of the national innovation system, encourage enterprises to take the lead in implementing major science and technology projects, support the cooperation of research institutes, universities and enterprises in integrating innovation, and accelerate the transformation and application of innovation achievements. In addition, the participation of local colleges and universities in collaborative innovation has many benefits. On the one hand, it can improve the quality of personnel training in local colleges and universities, promote their development of scientific research; on the other hand, it can help to create a good regional innovation atmosphere, accelerate the transfer of regional industries, improve regional innovation capacity, and promote regional economic construction and social development.

2. Literature Review

At present, the research of university collaborative innovation mainly focuses on the following three points: first, the position of university in collaborative innovation. Yin Xiangwen [1] believed that in collaborative innovation, universities should carry out heterogeneous positioning according to specific conditions, but the value pursuit of talent training, scientific research, social services and cultural heritage is the focus of university participation in collaborative innovation. At the same time, Charles [2] also pointed out that universities should become the "knowledge infrastructure" of innovation. Second, the research on the non-linear complex cooperative relationship between universities and other subjects. These researches focus on how to reasonably construct the collaborative relationship between universities and other subjects to achieve the synergistic effect, and analyze in detail the key factors and network models that affect the construction of the relationship network, such as the cooperation between universities and enterprises or industries [3], the combination of universities and research institutions and the government [4, 5]. Third, the research on the elements of collaborative innovation in colleges and universities. These researches
pay more attention to the construction of collaborative innovation ability of universities, such as market-oriented ability [6], organizational structure [7], scientific researchers [8], etc. Although there are few researches directly on the mechanism of collaborative innovation in colleges and universities, such researches have been initially carried out. For example, the research of Laursen et al. [9] highlighted the importance of selection mechanism of collaborative innovation object by exploring the impact of innovation type, geographical location and university quality on the selection mechanism. Shan Mingfeng et al. [10] qualitatively constructed framework of the three-level collaborative innovation operation mechanism. Liu Xiaowen et al. [11] introduced the concept of governance, proposed a general and customizable governance reference model, which provided a set of referential methodology for university scientific research management institutions to design and build systems around collaborative innovation; Zhang Ganggang et al. [12] focused on the management mechanism through qualitatively analyzing the problem of "optimization path of management mechanism of collaborative innovation in colleges and universities".

3. The Problems of Regional Collaborative Innovation in Ningbo Colleges and Universities

In recent years, Ningbo universities have actively participated in regional collaborative innovation, and established different levels of collaborative innovation centers. Taking collaborative innovation centers at the municipal level as an example, at present, Ningbo has established 16 collaborative innovation centers covering 12 universities, which have a positive impact on regional industrial and economic and social development. For example, the "Ningbo Regional Characteristic Aquatic Seed Industry Collaborative Innovation Center" of Zhejiang Wanli University has successfully promoted their achievements in new varieties and new cultivation technologies of aquatic products in Ningbo, resulting in higher economic and social benefits. However, there are also some problems in the process of Ningbo colleges and universities’ participation in regional collaborative innovation.

First, the collaborative innovation level is low. At present, there are few national and provincial collaborative innovation platforms in Ningbo. For Ningbo universities, the foundation for collaborative innovation is weak, and there is currently no strength to build a national-level collaborative innovation platform. There is a significant gap between the basic conditions and scientific research strength of Ningbo local colleges and universities in terms of subject setting, subject team, subject funding and experimental equipment. Some colleges and universities have not implemented collaborative innovation as a major strategic deployment to promote the development of colleges and universities. Instead, they have limited collaborative innovation to the traditional areas of industry-university-research collaboration, and lacked more effective measures to dig deeply out collaborative innovation breakthroughs in the characteristics and advantages.

Second, the collaborative innovation results do not match the needs. Sometimes, the scientific research achievements in colleges and universities are difficult to meet the needs of product research and development of enterprises, the mismatch between capabilities and needs hinders collaborative innovation. On the one hand, there are fewer investments in research and development in some industry sectors, which increases the cost of technology transfer and cooperation in universities. For example, the innovative research and development process in the field of medicine has the characteristics of large capital investment, long time period and slow economic benefits. For enterprises, it is difficult to obtain market benefits in a short time. As a result, most enterprises are more willing to choose the projects that have already produced research results for later cooperation, while the enthusiasm for participating in the early research of the project are not great.

Third, the collaborative innovation subject always belongs to different departments, which makes it difficult to form a complete management system. Universities often obtain scientific research resources through competition from individuals or research groups. However, due to incomplete systems, these resources are difficult to integrate and lack public platforms for technological innovation. In addition, scientific research in colleges and universities tends to be individualized and lack of organized scientific and technological research. It is difficult to solve the needs and problems of major strategies facing reality and market. On the contrary, it has spawned a large number of "academic achievements" without originality and practical value.
Fourth, colleges and universities lack innovative talents. The lack of talents leads to the lack of motivation for university researchers to carry out scientific and technological innovation facing the market. It is difficult to combine academic and productivity, some colleges and universities even just take publishing academic papers as their ultimate goal.

4. The Mechanism Design of Deepening Regional Collaborative Innovation in Colleges and Universities

4.1 Establish a resource coordination mechanism

The construction of resource coordination mechanism is conducive to the integration of innovative resources, the acceleration of resource convergence, the realization of complementation of elements, and the smooth convergence of innovative elements. Firstly, the construction of the resource coordination mechanism needs to improve the coordination of input capital. Specifically, we should scientifically manage and maximize the use of research funding, and promote more investment in scientific research and technological innovation to promote the output of innovative results by rationally allocating funds for different types of research. Secondly, the construction of resource coordination mechanism needs to improve the coordination of human resources. Talents of local colleges and universities are responsible for technology research and development, and apply technology to production lines, while talents of enterprises can improve research results according to market demand. Through cooperation, talents of local colleges and enterprises can give full play to the potential of human resources. At last, the construction of resource coordination mechanism needs to improve the coordination of information resources. We should establish a common information platform to realize the exchange and interconnection of technical information and market information, and then carry out targeted technology research and development to produce products needed by consumers, so as to improve the efficiency of collaborative innovation.

4.2 Establish an interest coordination mechanism

It is necessary to establish the interest coordination mechanism. Because only by handling the problem of interest division among different subjects on the principle of "fairness, justice and openness", respecting the reasonable interest demands of all subjects, and fully coordinating their interest conflicts, can all subjects basically satisfy their own interests and fully mobilize their innovation enthusiasm, so as to promote the smooth operation of collaborative innovation mechanism. On the one hand, the establishment of the interest coordination mechanism needs to follow the principle of consistent income and input. Before the distribution of benefits, the resources invested by each subject should be scientifically evaluated, and the benefits should be distributed according to the input of all parties; on the other hand, the principle of correlation between return and risk must be followed as well. In the process of collaborative innovation, due to the different tasks and depth of cooperation of each subject, the types and sizes of risk-taking are also different. Therefore, it is necessary to determine the proportion of interest distribution by considering the risk-taking of different subjects. In brief, the distribution of interests among enterprises, schools and research institutes is a process of joint decision-making and mutual consultation. In the process of interest distribution, we need to coordinate the interests of all parties, and ultimately achieve the maximum collective satisfaction.

4.3 Establish a management coordination mechanism

It is of great significance to establish the management coordination mechanism through the management construction of mode, decision-making mechanism and platform to achieve the optimization of regional collaborative innovation effect. Firstly, establishing a management collaboration mechanism requires optimizing the collaborative innovation model. At present, it is necessary to promote the development of the three-helix collaborative innovation model between government, enterprises and local colleges and universities, because only by breaking the barriers between the subjects and making them complement each other and develop in coordination can we
fully stimulate the innovation potential of the subjects. Secondly, establishing a decision-making mechanism for collaborative innovation is an important part of establishing a management coordination mechanism for the reason that the establishment of a decision-making mechanism can help to manage and coordinate the various problems, thus ensuring the orderly process of the collaborative innovation. Thirdly, the establishment of management coordination mechanism requires the establishment of collaborative innovation platform. Local colleges and universities build collaborative innovation platform by building industry-university-research cooperation base and R&D alliances with industry enterprises and local governments, which is conducive to the integration of colleges and universities into the regional innovation system and continuous deepening of regional ties. In short, by closely integrating the status quo and development direction of regional industry development, establishing a management coordination mechanism can help colleges and universities to provide new knowledge and new technologies for the industry to take off, and continuously improve their scientific research strength and regional economic contribution.

5. The Path Selection of Promoting Ningbo Colleges and Universities to Participate in Regional Collaborative Innovation

5.1 Increase investment

Increasing investment is one of path selections to enhance the participation of Ningbo universities in regional collaborative innovation. The specific implementation methods are as follows: first, we should improve the collaborative innovation preferential policies and allocate more resources to innovation activities as well as reduce innovation costs and risks, such as granting subsidies and tax incentives for individual collaborative innovation projects; moreover, we should set up special funds for collaborative innovation projects, which should be specially used for the construction and operation of collaborative innovation project and the establishment of innovation achievements industrialization rewards with the focus of supporting Ningbo's trillion-level industry.

5.2 Consolidate the foundation of innovation

The foundation of innovation of Ningbo colleges and universities should start from the discipline construction. On the one hand, Ningbo colleges and universities should give priority to the development of key disciplines and advantageous disciplines, integrate interdisciplinary resources to promote the development of related disciplines, so as to improve the overall level of discipline construction. On the other hand, they should create a new growth points of disciplinary and cultivate new disciplines that meet the needs and development direction of Ningbo regional industry to serve the regional economy.

5.3 Scientific distribution of interests

The distribution of benefits of collaborative innovation in colleges and universities should take into account the distribution of benefits of scientific researchers. On the one hand, we should further improve the long-term incentive mechanism for scientific researchers and fully consider the differences between researchers and post positions on the principle of people-oriented. On the other hand, we should establish various incentives, such as material incentives and spiritual incentives, quantitative incentives and quality incentives, process incentives and outcome incentives, and other incentives in parallel, encourage and support researchers to actively participate in collaborative innovation.

5.4 Strengthen evaluation feedback

Strengthening evaluation feedback requires the implementation of a comprehensive, multi-agent collaborative assessment mechanism. While comprehensively considering the ability, performance, morality and other aspects of scientific research personnel, colleges and universities need to include the evaluation of collaborative innovation interest communities such as governments and enterprises into the evaluation mechanism, so as to form a comprehensive evaluation of scientific research personnel. In addition, through the establishment of a classification assessment
mechanism, the scientific research personnel are assessed for different subject areas and different scientific research projects; taking into account the teamwork characteristics of collaborative innovation projects, a team evaluation mechanism can be established to focus on team innovation output and innovation performance.

5.5 Improve collaborative innovation environment

It is very important for the government to create a good collaborative innovation environment through various propaganda means to encourage and guide local colleges and universities to participate in collaborative innovation. Nowadays, we should strengthen the collection, centralized release, dynamic update and implementation of supporting policies at all levels, so that the public can know that collaborative innovation is a new mode of scientific and technological innovation. The target propaganda should include enterprises, local colleges and universities, scientific research institutes, financial institutions and other innovative subjects and service units. Meanwhile, through briefing, app, wechat, government information network and other information platforms, the development goals and major collaborative projects of science and technology collaborative innovation should be well known. In addition, we can also conduct various innovation and entrepreneurship competitions to tap and cultivate scientific and technological collaborative innovation talents. Through these means of propaganda, we can create a good atmosphere of innovation and rich humanistic environment in the society.

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