

Research on the Strategies of Government Subsidies to Promote the Green Technology Innovation Ability of Anhui Pharmaceutical Manufacturing Industry

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Abstract

Technological innovation is an important means to improve the core competitiveness of enterprises, and it is also the key for China to catch up with technology and become an innovative country. The report of the 18th National Congress of the Communist Party of China emphasized that China should adhere to the strategy of innovation-driven development, which clarified the core position of technological innovation in the overall development of the country. As one of the high-tech industries, pharmaceutical manufacturing needs to constantly improve the level of technological innovation in order to stand out in the fierce market competition. However, the dual constraints of resources and environment seriously restrict the development of technological innovation. In this context, China's "Thirteenth Five-Year Plan" outlines the concept of green development, and advocates vigorously developing green technology innovation activities while guiding enterprises to improve innovation efficiency. To this end, China's central and local governments have issued a large number of subsidy policies to support innovation, trying to provide R&D funding to pharmaceutical manufacturing enterprises by means of science and technology funding, in order to stimulate the enthusiasm of enterprises for innovation. As the resource support of green technology innovation activities, green R&D investment has a direct impact on promoting enterprise pollution control and cleaner production technology innovation, and is an important way to improve carbon productivity and realize the common growth of economic and ecological benefits. So, at this stage, does the government subsidy policy in Anhui Province play an incentive role in the green R&D investment of pharmaceutical manufacturing industry? Is there a threshold for this incentive? The discussion of the above problems in this paper will not only help to understand the current government subsidy policy system in Anhui Province, but also provide a theoretical basis for further improving the government subsidy policy, so as to better promote the coordinated development of green economy and ecological benefits of pharmaceutical manufacturing enterprises in Anhui Province.

Keywords

Government Subsidies; Pharmaceutical Manufacturing Industry; Green Technology; Anhui Province.

1. Background

China's high-quality economic development has put forward higher requirements for manufacturing enterprises. As one of China's high-tech industries, pharmaceutical manufacturing industry is an inexhaustible motive force for its development. However, it faces great environmental pressure while achieving economic growth, and has become a heavily polluted industry designated by the Ministry of Environmental Protection. Green innovation is the only choice to break through the constraints of resources and environment, enhance the competitiveness of enterprises and achieve sustainable development[1]. Taking Anhui

Province as an example, this paper finds that most pharmaceutical manufacturing enterprises in Anhui Province are unwilling to take the initiative to carry out green technology innovation because of the dual externalities of green technology innovation activities, and their green technology innovation ability cannot be improved. Therefore, in recent years, the Anhui provincial government has increased subsidies to pharmaceutical manufacturing enterprises to support and promote them to carry out green technology innovation activities. So whether government subsidies can effectively encourage pharmaceutical manufacturing enterprises to carry out green technology innovation and enhance their own green technology innovation ability needs our exploration[2].

2. The Development of Green Technology in Anhui Pharmaceutical Manufacturing Industry

As an important export base of chemical raw materials in China, Anhui Province has actively promoted the transformation and upgrading of the pharmaceutical industry in recent years, accelerating the transformation from a "big pharmaceutical city" to a "strong pharmaceutical city", and the pharmaceutical industry has strong competitiveness in the international market. In addition to external factors such as government subsidies, the improvement of Anhui's green technology innovation ability is related to the internal system of enterprises, which plays a more fundamental role[3]. Corporate governance is the core of the internal system of enterprises, which can stimulate the technological innovation potential of enterprises by integrating and mobilizing enterprise resources and incentive mechanisms. In the corporate governance structure, the board governance has a particularly significant impact on enhancing the technological innovation capability. As the board of directors is the main strategic decision-making force of the company, the role of the board of directors is particularly important for the formulation of such major strategic decisions as green technology innovation. The governance level of the board of directors determines whether the green technology innovation decision of enterprises can be successfully passed and implemented, and ultimately it is related to whether enterprises can effectively use government subsidies to enhance their green technology innovation ability. Therefore, in this paper, we consider the differences in the effect of government subsidies on green technology innovation ability among pharmaceutical manufacturing enterprises in Anhui Province with different scales and ownership structures. On this basis, this paper puts forward some countermeasures and suggestions suitable for Anhui Province, in order to provide scientific guidance and theoretical basis for improving the green technology innovation ability of pharmaceutical manufacturing enterprises in Anhui Province[4].

3. Anhui Pharmaceutical Manufacturing Enterprises Green Technology Innovation Ability Promotion Strategy

3.1. Give Full Play to the Leverage Effect of Government Subsidies

(1) Adhere to the principle of moderate subsidies.

As one of the main external sources of enterprise innovation funds, government subsidy is an effective policy tool to encourage enterprises to innovate. The conclusion of this paper affirms the incentive effect of government subsidies on the input and output capacity of green technology innovation in pharmaceutical manufacturing enterprises[5]. Therefore, in order to guide pharmaceutical manufacturing enterprises to continuously carry out green technology innovation, we must give full play to the leverage effect of government subsidies. According to the statistical data of China Statistical Yearbook of Science and Technology, in recent years, the amount of R&D subsidies provided by the Chinese government to the pharmaceutical

manufacturing industry has shown a rapid growth trend, from 831 million yuan in 2009 to 2.061 billion yuan in 2017, with a compound annual growth rate of 12.02%, which shows that the China government attaches great importance to the technological innovation of the pharmaceutical manufacturing industry. However, governments at all levels should adhere to the principle of moderate subsidies while increasing the intensity of subsidies. According to the test results of the threshold effect of government subsidies, there is an optimal range for the intensity of government subsidies. Therefore, government departments should appropriately adjust the intensity of government subsidies according to the response of the green technology innovation ability of pharmaceutical manufacturing enterprises to government subsidies, so as to maximize the "leverage effect" of government subsidies[6].

(2) Adopting diversified subsidies.

At present, the form of government subsidies implemented in China is too simple, and monetary funds are mainly distributed to enterprises through the way of first approval and then appropriation. This form of subsidy requires a high degree of enterprise information held by government departments and the integrity of enterprises, and some enterprises will cheat subsidies by concealing the actual situation. In addition, when the government provides a "helping hand" to enterprises, it pays more attention to the close relationship between government and enterprises, but ignores the innovation will of enterprises. In this case, enterprises will try their best to improve the relationship between government and enterprises to obtain government subsidies. The above-mentioned subsidy form of first approving and then allocating funds makes it more difficult for the government to supervise subsidies, and it is difficult to control the actual use and destination of government subsidies, and it is even more difficult to ensure the utilization efficiency of subsidy funds. Therefore, government departments should appropriately adopt diversified forms of subsidies to increase the control of government subsidy funds, so as to ensure that government subsidy funds play the expected role in guiding enterprise innovation[7]. In addition to the form of subsidies after approval, governments at all levels can also appropriately adopt the form of subsidies during the event and rewards afterwards. In-process subsidy means that when an enterprise has started an innovative project and the enterprise has invested its internal funds into the project, the government department decides the amount of follow-up R&D subsidy according to the progress of the enterprise project and the degree of capital demand. Although this form of subsidy has a heavy workload for government departments, it can effectively guarantee the actual use and efficiency of government funds. After-the-fact reward refers to that the government gives incentive funds to enterprises to encourage them to continue to innovate after they have obtained research results through innovative projects[8]. Because this kind of subsidy can only arouse the enthusiasm of enterprises to carry out innovation in the later stage, it has little guiding effect on the current innovation of enterprises. Therefore, government departments should flexibly choose the appropriate subsidy form according to the situation of enterprises. In addition, government departments can also provide R&D subsidies to enterprises in the form of non-monetary funds, such as R&D equipment and equity incentives, which can ensure the efficiency of government subsidies to a certain extent.

3.2. Implementation of Differentiated Government Subsidy Policies

(1) Consider the needs of enterprises of different sizes for government subsidies.

In pharmaceutical manufacturing enterprises of different scales, the response of green technology innovation ability to government subsidies is different, and the government needs to provide targeted subsidies according to the scale of enterprises. Compared with small-scale enterprises, government subsidies have a more significant incentive effect on the input and output capacity of green technology innovation in large-scale enterprises, indicating that government subsidies are more likely to play a "leverage effect" in large-scale enterprises.

Enterprises will fully consider the influence of various factors when selecting innovative projects, among which their own financial situation and innovative strength will determine whether they can ensure the smooth development and operation of innovative projects. Especially for small and medium-sized enterprises, even if they start innovative projects with the financial support of the government, they may not be able to effectively maintain the project operation because of their own lack of innovative qualifications and capital stock, and the subsequent output of innovative achievements will also be pessimistic. Therefore, the government should implement different subsidy policies according to the scale of enterprises, and tend to large-scale enterprises to a certain extent, so as to better realize the effective allocation of resources and guide the green technology innovation ability of pharmaceutical manufacturing enterprises to a higher level.

(2) Weigh the policy inclination of government subsidies between state-owned enterprises and non-state-owned enterprises.

Due to the natural connection between state-owned enterprises and the government, the government subsidies obtained by enterprises with different ownership systems are different. According to the empirical test results of this paper, although state-owned enterprises have received more government subsidies, the influence of government subsidies on the input and output capacity of green technology innovation of state-owned enterprises is not as significant as that of non-state-owned enterprises. It shows that even with the same level of government subsidies, the differences in policy burden, management level and innovation efficiency of enterprises with different ownership will lead to different subsidy effects[9]. At the same time, because the resources of non-state-owned enterprises are at a disadvantage, the support of government subsidies can effectively stimulate the innovation enthusiasm of non-state-owned enterprises, thus making more effective use of government funds. Therefore, this paper suggests that governments at all levels should weigh the policy inclination between state-owned enterprises and non-state-owned enterprises, appropriately reduce the subsidy amount of state-owned enterprises, gradually increase the subsidy of non-state-owned enterprises, and rationally allocate financial support funds for pharmaceutical manufacturing enterprises, so as to maximize the expected effect of government funds and avoid the waste of financial resources.

3.3. Improve the Government Subsidy Supervision Mechanism

(1) Improve the screening mechanism of subsidy targets.

This paper suggests that the government should strengthen the screening mechanism of supporting enterprises and reasonably determine subsidized enterprises and innovative projects before implementing the subsidy policy[10]. When choosing subsidized enterprises, we should focus on the innovation qualification of enterprises, such as R&D strength and innovation will, so as to ensure that the signals about the target enterprises released by government subsidies match those released by enterprise innovation orientation, so as to distribute financial funds to innovative enterprises with real strength and development potential, and avoid investing precious financial resources in rent-seeking enterprises and zombie enterprises that should be eliminated by the market. In addition, factors such as enterprise scale, profitability and capital structure should also be included in the screening mechanism. The government can't decide the policy orientation only based on the ownership structure of enterprises, otherwise it will affect the innovation enthusiasm of enterprises. When choosing subsidized projects, the government should pay attention to the advanced and innovative nature of innovative projects, and evaluate the development prospects of innovative projects, and select the projects with greater influence to give support and guidance.

(2) Strengthen the evaluation system for government-subsidized projects.

Due to the inevitable information asymmetry between the government and enterprises, the fairness and effectiveness of subsidies cannot be guaranteed only by relying on the screening

mechanism before subsidies. It is also necessary to strengthen the evaluation system and scientifically and reasonably evaluate government subsidy projects in order to promote enterprises to use government funds reasonably and effectively. With regard to the strengthening of the evaluation system of government subsidies, we should first attach importance to the evaluation of innovation achievements and appropriately increase reward and punishment measures. If the evaluation results show that the actual innovation achievements of enterprise projects are inconsistent with the declared ones, or there is a big gap with the expected achievements, enterprises should pay the corresponding "liquidated damages" to the government, which can have a certain deterrent effect on enterprises. If the actual innovation achievement of an enterprise is higher than the expected target, the government can reward the enterprise, thus stimulating the innovation enthusiasm of the enterprise. Secondly, the evaluation of government-subsidized projects should implement the principles of fairness, justice and openness, establish and improve the peer evaluation system and the credit system of evaluation experts, and make the evaluation process public, strengthen the supervision of public opinion on the evaluation, and prevent the evaluation experts from having interest relations with the evaluated enterprises.

(3) Improve the information disclosure system of government subsidies.

At present, China's information disclosure system on the actual use of government subsidies is still not perfect. It does not rule out that some enterprises will use their funds for other purposes after receiving government subsidies, such as investing in other non-innovative profit-making projects or using government funds to make up for the losses of enterprises, thus reducing the utilization efficiency of government subsidies. Therefore, this paper suggests that China should establish and improve the information disclosure system of government subsidies from both the government and enterprises. First of all, the government should use the official website to announce the standards of key support projects and disclose them, and publicize the progress of the projects to facilitate the supervision of the public. Secondly, enterprises should actively disclose the actual use and destination of government subsidies. At present, only listed companies in China have the obligation to disclose government subsidy information, but the information disclosed is often insufficient. Most listed companies only disclose the total amount of government subsidies in their annual reports, while few listed companies mention the specific amount of subsidies for each innovation project. Therefore, China should take listed companies as a pilot, encourage enterprises to voluntarily disclose relevant information, and force enterprises to disclose in detail at least the way and amount of government subsidies and the progress of innovative projects.

3.4. Improve the Corporate Governance of the Board of Directors

(1) Maintain a reasonable board size.

As the center of the company's internal governance structure, board governance is an important provider of innovative resources needed by enterprises and a decision-maker of technological innovation. Therefore, enterprises should pay special attention to the important role of the board of directors in specific innovation activities. According to the empirical results of this paper, a larger board of directors is conducive to promoting the innovation activities of enterprises and improving the utilization efficiency of government subsidies. On the premise of maintaining a reasonable board size, pharmaceutical manufacturing enterprises should also avoid the blind expansion of the board size, and can set the board size according to factors such as enterprise size and business needs. In addition, the size of the board of directors should not only be reflected in the number of members, but also represent the collection of comprehensive qualities of board members. Enterprises should pay special attention to the reasonable collocation of board members with different education levels, professional backgrounds and different ages, and strengthen the sharing and transfer of knowledge and skills in different

aspects, so as to build a board with richer knowledge resources and higher strategic decision-making ability, which will help enterprises seize the development opportunity of improving innovation ability.

(2) Enhance the independence of the board of directors

The independence of the board of directors, that is, the proportion of independent directors, will greatly affect whether the board of directors can maximize the long-term interests of enterprises without being manipulated by a few major shareholders, and will also affect the fairness of the decision-making of the board of directors, thus affecting the effectiveness and rationality of the allocation of innovative resources. The empirical test results of this paper confirm that a high proportion of independent directors can indeed have a positive impact on the green technology innovation ability of pharmaceutical manufacturing enterprises, and help government subsidies to play a "leverage effect" in enterprises. Therefore, pharmaceutical manufacturing enterprises should appropriately increase the proportion of independent directors according to their own actual conditions and enhance the independence of the board of directors. At the same time, pharmaceutical manufacturing enterprises can cooperate with universities and scientific research institutions, hire experts and professors with relevant professional knowledge as independent directors, improve the voice of independent directors, and try to provide them with long-term incentive compensation mechanisms such as equity and options, so as to give full play to the role of independent directors in enterprise innovation decision-making and supervision and restraint.

4. Summarize

From the perspective of government and enterprises, this paper puts forward some strategies to improve the green technology innovation ability of pharmaceutical manufacturing enterprises in Anhui Province. The government should adhere to the principle of moderate subsidy when providing subsidy funds to the supporting objects, and adopt diversified subsidy methods appropriately to maximize the leverage effect of government subsidies. The government should implement differentiated subsidy policies according to the scale of enterprises and the heterogeneity of ownership structure. The government should improve the supervision mechanism of government subsidies by improving the screening mechanism of subsidy objects, strengthening the evaluation system of subsidy projects and improving the disclosure of government subsidies information. Pharmaceutical manufacturing enterprises should start with the scale and independence of the board of directors, and improve the governance level of the board of directors by maintaining a reasonable board size and appropriately increasing the proportion of independent directors, which will help enterprises to make green innovation decisions.

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References

- [1] Hu yue. research on the influence of government subsidies on the investment decisions of pharmaceutical manufacturing enterprises [D]. Tianjin normal university, 2022. doi: 10.27363/ d. cnki. gtsfu. 2022.2002100000005.
- [2] Yang Huan, Wang Jialuo, Gao Ziwen, Chu Shuzhen. Study on the Heterogeneity of Government Subsidies and R&D Investment on the Performance of Pharmaceutical Enterprises [J]. China Journal of New Drugs, 2022,31(04):312-318.

- [3] Wei Wen. The influence of government subsidies and R&D investment on enterprise performance [D]. Xi 'an University of Science and Technology, 2021. DOI: 10.27397/ D.CNKI. GXaku. 20007. 000000000606.
- [4] Zhang Fulin. q research on the efficiency of technological innovation in pharmaceutical manufacturing enterprises [D]. Guizhou university, 2021. doi: 10.27047/ d.cnki.gudu. 20021. 200080080806.
- [5] Chen Xiaochun. Study on decision-making of pharmaceutical supply chain with multi-factor disturbance [D]. Beijing Jiao Tong University, 2021. DOI: 10.26944/ d.cnki. gbfju. 20010. 00000 000005.
- [6] Zhang Jing. An empirical study on the influence of government subsidies and financing constraints on R&D investment of pharmaceutical manufacturing enterprises [D]. Southwestern University of Finance and Economics, 2021. doi: 10.27412/d.cnki.gxncu.20001.000000000606.
- [7] Yao Liangyan. Research on the influence of R&D alliance on enterprise innovation [D]. Lanzhou University, 2021. doi: 10.2204/d.cnki.glzhu.2021.2001000000807.
- [8] Natalie. Did government subsidies promote the performance of pharmaceutical manufacturing enterprises? South China university of technology, 2021. doi: 10.27151/d.cnki. ghnl. 20080. 000000000605.
- [9] Xu Xiaofeng, Cao Siyi, Meng Xiaofei. Research on improving the performance of innovation subsidies for listed medical enterprises in China [J]. Journal of Tongji University (Natural Science Edition), 2021, 49(04):606-616.
- [10] Tian Hongna, Liu Siqi. Research on the impact of government subsidies on green R&D investment-based on the empirical test of pharmaceutical manufacturing enterprises [J]. Science and Technology and Management, 2019,21 (06): 45-52. DOI: 10.16315/j.stm.2019.06.013.