

# Research on the Function of Government Fund Support in Pharmaceutical Industry Technology Innovation

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## Abstract

Pharmaceutical technology innovation process needs a lot of human, material and financial support, so the government must give full play to its financial support function. Specifically, the government should improve the fund investment mechanism of the pharmaceutical industry, improve the financial investment management system of pharmaceutical technology innovation, strengthen the function and mechanism of the capital market, improve the risk investment system, focus on cultivating a good credit environment, and increase the support of national policy-based financial institutions. Through direct investment, financial subsidies, tax incentives and low-interest financing and other means, vigorously promote the improvement of pharmaceutical innovation capacity.

## Keywords

Pharmaceutical Technology Innovation, Government, Financial Support

## 1. Introduction

Government is one of the core elements of national innovation system, the maker of innovation system and the maintainer of innovation order, as well as one of the important subjects of technological innovation process. Technological innovation activities in pharmaceutical industry have high external economy, and there are various risks and uncertainties in the innovation process. It is difficult to achieve the optimal level of technological innovation activities only by the role of market mechanism. Therefore, the government must give full play to its functions to guide the direction of technological innovation, regulate technological innovation behavior, fund technological innovation activities, protect

the rights and interests of technological innovation, build technological innovation environment, and organize technological innovation service, so as to improve China's technological innovation ability on the whole.

## **2. To Improve the Mechanism of Capital Investment in the Pharmaceutical Industry**

### **2.1. To Establish a Mechanism for the Steady Growth of Financial Investment in Medical Technology Innovation**

The fundamental characteristic of the pharmaceutical industry is high investment, and as a knowledge-intensive industry, only sufficient investment in research and development can ensure that the pharmaceutical industry has the ability of technological innovation, to ensure that the technological innovation achievements remain advanced [1]. In recent years, the R&D investment of China's pharmaceutical enterprises has increased rapidly, and the government has gradually increased the financial support for technological innovation of pharmaceutical enterprises. However, the proportion of pharmaceutical R&D expenditure in China's industrial added value still lags far behind that of developed countries. In addition, pharmaceutical technology innovation is a very long process, R&D investment is a continuous and stable process, and the influence of government funding on enterprise R&D investment has a lag, so the government must establish a mechanism for stable growth of financial investment.

According to the actual situation of China's economic operation, we should further increase the financial input to pharmaceutical industry technological innovation, and increase the proportion of financial input in pharmaceutical industry added value. At the same time, it is necessary to stimulate the enthusiasm and initiative of local governments in technology investment through the guidance of relevant fiscal and tax policies, so as to ensure that the scale of medical financial investment has been greatly improved in total.

In the preparation of the annual government budget, we should establish the guarantee mechanism of the government's financial investment in medicine, ensure that the government's financial investment in the technology innovation of the pharmaceutical industry is higher than the growth rate of the regular revenue of the pharmaceutical industry according to the system, and ensure the standardization, openness and transparency of the budget. In the implementation process of government budget, if the increase of pharmaceutical financial investment is not up to the standard, the budget should be adjusted in time, appropriate arrangement of additional financial expenditure of science and technology, through a series of measures, to ensure the sustainable and stable growth of financial investment in science and technology.

### **2.2. To Optimize the Financial Investment Structure of Medical Technology Innovation and Rationally Allocate Public Financial Funds**

Rational allocation of innovation funds is the key to optimize the structure of fi-

nancial investment. The government's financial input to the pharmaceutical industry should adhere to the principle of "giving prominence to key points and giving consideration to general ones; We will adjust and optimize the structure of financial investment according to the principle of "advance and withdraw, and support the best", and focus funds on key R&D projects and cutting-edge technology development such as anti-tumor drugs, therapeutic vaccines and drugs for chronic diseases. Focus on supporting the failure areas where market mechanism cannot allocate resources effectively, such as medical technology basic research and public welfare research, to reflect the policy, public and strategic nature of government medical financial input, and actively promote the strategic structure transformation of financial input to medical technology innovation activities.

Through the establishment of new drug research and development, information services, analysis and testing, achievement transformation, investment and financing services, marketing, human resources and other platforms, effectively integrate the medical technology innovation resources in the region. At the same time, improve the national sharing mechanism of medical information data, part of the data and equipment, to provide good basic conditions and favorable external environment for the research and experimental development of medical technology.

We will give priority to, focus on, and steadily increase R&D funding for basic research institutes and universities, and effectively increase the absolute scale and relative proportion of funding for basic medical research in the total funding for medical technological innovation. We should increase investment in the research and development of anti-tumor drugs, therapeutic vaccines, diabetes, cardiovascular and cerebrovascular diseases and other chronic diseases. Research and development of medical technology can be encouraged and supported by increasing special allocations, setting up special funds and providing loan guarantee, so as to maximize the multiplier effect of financial investment in science and technology.

### **2.3. Innovation of Medical Technology Innovation of Financial Investment, to Improve the Efficiency of Capital Investment**

In the technological innovation of the pharmaceutical industry, the investment mode of direct financial allocation by the government may have two effects on the R&D investment of enterprises: The first is the incentive effect, government input can stimulate enterprise R&D investment, promote pharmaceutical technology innovation; The other is crowding out effect. Government subsidy will reduce R&D investment of enterprises, so it is difficult to promote technological innovation. We should constantly reform and adjust the way of financial input according to the actual effect of government financial support.

The idea of improving the management of financial investment in pharmaceutical technology innovation is as follows: the financial investment should be transformed from the government allocation of public financial funds to the

formation of diversified innovation investment system. The innovation policy should be changed from the segmented departmental science and technology policy to the unified comprehensive policy, and the government's goal of technological innovation management should be changed from the examination and approval of projects to the cultivation of innovation platform and institutional environment.

Encourage social capital and enterprise capital to participate in various special programs organized by the state. We can attract financial capital and enterprise funds into various national project support plans by means of financial guarantees, venture capital, discount interest on loans, and late-stage project subsidies. While reducing the pressure on government funds, it also guides social capital to focus on government projects.

The direct financial input should be mainly aimed at some basic and theoretical basic research projects, because these projects have the nature of public products because of the spillover of basic research. For those applied research projects that directly generate economic benefits for enterprises, social capital input is mainly guided through indirect ways such as preferential fiscal and tax policies or other technical support strategies.

The government may try to match fiscal funds with social funds, and openly entrust basic and public welfare research projects to social scientific research institutions for research through various forms of bidding. After obtaining the research results, the government will purchase the funds. Or to give these research institutions government subsidies to improve the use efficiency of government science and technology investment funds. It can also directly entrust important projects originally led by government funds to private enterprises in the form of "build-operate-transfer", so as to improve R&D efficiency through market-oriented operation.

### **3. To Improve the Performance Evaluation Method of Financial Investment in Medical Technology Innovation Projects**

In order to ensure that the government's financial investment can indeed stimulate the innovation of medical technology, reduce the risk of capital investment, and improve the input-output efficiency of government funds, it is necessary to establish a practical, scientific and practical fund investment performance evaluation system. Through the performance evaluation of medical technology innovation projects with government funds, we can correctly judge whether the government funds have played a good role in promoting technological innovation.

#### **3.1. To Re-Construct the Evaluation System of Financial Investment in Medical Technology Innovation Projects**

In order to better promote the process of fiscal revenue and expenditure reform, it is necessary to use more scientific, objective and comprehensive comparison and evaluation criteria to accurately evaluate the social and economic benefits of

medical technology innovation projects invested by the government financial funds. Only in this way, the performance of medical financial investment can be reasonably evaluated, and according to the evaluation results, the investment planning of funds can be adjusted, and the management of financial investment funds can be further strengthened [2].

The performance evaluation of medical technology innovation project is a process of correctly understanding the objective existence from the subjective point of view. It is a dynamic and constantly changing process, and deviation should be avoided as far as possible. At the same time, it should be clearly recognized that only comparable innovation projects can be compared and analyzed according to the corresponding indicators. Therefore, first of all, the comparability of each evaluation index should be carefully weighed to minimize the error caused by human factors. At the same time, basic research projects and applied research projects should be classified and evaluated according to the different research properties of innovative projects.

### **3.2. To Strengthen the Integration and Coordination of Various Technical and Financial Support Policies**

First, we will better coordinate fiscal input between the central and local governments. We should define the key areas of central and local financial investment in science and technology, namely the scope of authority. The central government is mainly responsible for basic research, public welfare research, R&D of cutting-edge medical technologies, construction of service platforms for medical technology innovation, and R&D activities of strategic significance. Local governments are mainly responsible for the expanded research of pharmaceutical technological innovation achievements, industrialization and marketization of innovation achievements and other specific aspects, so as to avoid the waste and low efficiency caused by repeated investment by governments at different levels.

Second, we will strengthen top-level design and macro planning. Integrate all technological innovation budget funds of relevant government departments, make overall plans and coordinate rational allocation of government financial funds from the source, improve the chaotic pattern of repeated allocation and multiple management of medical technology R&D funds, and eliminate division of departments, regions and sections. Establish an overall coordination mechanism to realize the sharing of financial science and technology funds, so as to improve the use efficiency of science and technology funds. This needs a special management organization, perfect system guarantee and efficient expert decision-making mechanism.

The third is to adjust and optimize the existing technical innovation support policies from the perspective of institutional innovation, so as to achieve economic growth, the level of medical technology development and technological innovation environment to keep pace with The Times, to form institutional arrangements in line with the realistic requirements, and to promote the emergence of a good technological innovation atmosphere with incentive mechanism [3].

## 4. To Strengthen the Functions and Mechanisms of the Capital Market

Capital market can effectively solve the two major financing problems of technological innovation enterprises: information asymmetry and high risk caused by excessively long technology development cycle, thus providing stable external capital source for technological innovation of enterprises. In order to solve the problem of information asymmetry, first of all, enterprises with serious cheating behavior in the capital market should be seriously investigated and punished. In severe cases, the enterprises can be delisted from the market, so as to restrict the behavior of drug producers and dealers, and actively use legal means to protect the legitimate rights and interests of investors. Secondly, an open and transparent information system can be established and improved in the capital market. The government, as the department of monitoring information release, dissemination, utilization and regulation, has the obligation to establish an efficient information transmission system and increase information disclosure to reduce the cost of searching information.

In order to avoid the risk of long investment cycle and high cost of drug research and development, first of all, investors should consider that their capital cycle should be long enough before investing in new drug research and development. The investment and development phase of new drugs needs more than 7 years. Secondly, the scale of the investment fund must be able to accept the risk of project loss and ensure that the total loss of a project will not have a fatal impact on the benefit of the entire fund before investing in this new drug. The more important determinant is to pay attention to the change of disease spectrum, which determines the change of R&D direction of pharmaceutical enterprises. The more focused the research and development of new drugs, the easier it is to produce results.

Among them, after decades of development, the stock market has made great progress, but compared with the mature market of developed countries, there is a big gap in terms of scale, liquidity, market supervision level, and the quality of market participants. However, the bond market, another important part of the capital market, lags behind due to the imperfect credit rating system and the limited interest rate, which leads to the limited direct financing support of corporate bonds for enterprises. Therefore, it is necessary to strengthen the function and mechanism of China's capital market, so that all the capital markets at different levels play their due functions.

### 4.1. To Establish a Multi-Level Securities Market

It is necessary to continuously promote the leapfrog development of China's securities market supported by funds, establish the multi-level of the securities market, and promote the good operation of the gem market on the basis of the main board market and the small and medium board market. Gem is mainly to provide capital financing services for the start-up stage of enterprises, promote

the transformation of enterprises' innovation achievements, and provide the most effective exit mechanism for venture capital. The growth enterprise market has the advantage that the main board market does not have in the breadth and depth of technological innovation. Gem provides investors with different preferences with different risk-return portfolios, solves potential risks in the securities market, and strengthens the financial support function for technology-innovative enterprises.

In the specific operation process of gem, we should strengthen supervision, strictly grasp the quality of listed enterprises, and arrange the listing of pharmaceutical enterprises with high prospects of technological innovation; Pay attention to the construction of credit system, improve the information disclosure mechanism, to ensure the healthy operation of gem; Give full play to the positive role of gem market to promote the rapid and effective implementation of domestic technological innovation [4].

#### **4.2. To Accelerate the Development of the Bond Market**

To accelerate the development of China's bond market and give full play to its technical innovation support function, we need to expand the scale of corporate bond issuance and explore the local government bond market. To expand the issuance scale of corporate debt, the following aspects need to be achieved:

We will further improve the laws and regulations governing the issuance and trading of corporate bonds, standardize the operation procedures of the bond market, and relax the investment scope of funds raised by enterprises in bonds.

We will relax the conditions for issuing corporate bonds, encourage and support innovative enterprises to raise bonds, and improve the liquidity of corporate bonds.

Develop medium, and long-term bonds. Medium, and long-term bonds can provide a long-term source of funds for technological innovation of enterprises, reduce the cost of bank borrowing of enterprises, and improve the image and popularity of enterprises in the capital market, which is conducive to the development of enterprises.

#### **5. To Improve the Venture Capital System**

The main object of venture capital is high-tech industry and high-tech enterprises, especially small and medium-sized enterprises of science and technology. Medical enterprises committed to technological innovation are also important investment objects of venture capital. Venture capital can not only raise idle funds, fully mobilize the role of capital allocation, and provide financial support for technological innovation for enterprises. Moreover, venture capital subjects participate in technological innovation activities, direct management and supervision of innovation activities, and pay attention to the transformation of technological innovation achievements, which is conducive to improving the probability of success of technological innovation. But there are some problems such as the single cap-

ital source of risk investment in our development, the scale of risk investment capital is restricted, and the withdrawal mechanism of risk investment is also not perfect, which increases the degree of risk investment capital to bear.

### **5.1. To Establish and Improve Relevant Laws and Regulations**

Firstly, formulate corresponding policies, laws and regulations to establish a good macro environment for the operation of venture capital companies and the venture capital market, such as providing systematic financial support and credit guarantee.

Secondly, the intellectual property protection system should be improved to protect the basic elements of intellectual property and create a good environment for venture capital. Only by ensuring that technological innovation can obtain high returns can venture capital be attracted to enter [5].

### **5.2. To Broaden the Sources of Venture Capital Funds**

The property right of private capital is clear and it has a strong desire for appreciation, so effective policy protection and guidance can be adopted to encourage private capital and group capital to enter the venture capital market, mobilize the enthusiasm of private capital, and relax the conditions for foreign capital to enter the domestic venture capital. Drug research and development innovation to improve the health level in our country, especially the elderly is of great significance, so we can relax appropriately limit domestic pension funds and the social security fund investment, introducing a percentage of the fund risk investments, both to expand the pharmaceutical industry technology innovation risk capital source, and conducive to the maintenance and appreciation of the funds. Of course, to expand the source of capital, we must ensure the security of capital and the interests of all participants, rather than blindly expand.

In addition, the media should also be used to strengthen the publicity and encouragement of venture capital and technological innovation in the pharmaceutical industry, attract the attention of all aspects of society, and create a social atmosphere of innovation and support [6].

### **5.3. To Improve the Exit Mechanism of Venture Capital**

Only when venture capital exits smoothly can it realize capital appreciation and play the role of supporting technological innovation continuously. From the exit mechanism, the exit mechanism of American venture capital presents a diversification trend. The exit method of venture capital has IPO exit, share repurchase, project merger and acquisition exit and company liquidation. Among them, stock listing and acquisition by external institutions are more ideal exit methods. If venture capital lacks suitable exit channels and the capital running chain of venture capital is interrupted, the enthusiasm of venture investors will be greatly discouraged and the development of venture capital will be hindered. Therefore, we can learn from the experience of Japan, expand the number of the second

board market and reduce the listing conditions, so that venture capital can freely enter and exit venture capital enterprises through the securities market, which is the key to play the role of venture capital and promote the effective combination of venture capital and scientific and technological innovation.

## **6. Strive to Cultivate a Good Credit Environment**

### **6.1. To Establish an Enterprise Credit Evaluation System**

The inadequacy of the technology innovation fund mainly comes from the fact that there is not a very good enterprise credit evaluation system in our country. China should establish a more extensive enterprise credit system [7].

According to the scale and type of pharmaceutical enterprises, a credit rating system in line with international practice and the theory and method for determining the credit category of enterprises are formulated, and a scientific and unified credit evaluation index system is formed. Combined with the credit records of pharmaceutical enterprises, such as credit, tax payment, contract performance and product quality, the credit of pharmaceutical enterprises is refined and comprehensively evaluated.

Give full play to the role of the credit registration and consultation system of the People's Bank of China and the annual inspection system of industry, commerce and taxation departments, and establish a credit investigation system of pharmaceutical enterprises with the credit registration and consultation system of the People's Bank of China as the main part and the information consultation of commercial enterprise credit investigation companies, banks and enterprise industry associations as the auxiliary part. To provide banks and other financial institutions with comprehensive and specific credit status of pharmaceutical enterprises, to help financial institutions to make loan decisions.

Through the establishment of credit evaluation system, investors and related institutions can share the credit information of enterprises well, and reduce the information asymmetry. This also enhances the credibility of the enterprise itself, reduces the occurrence of default risk, and plays a good role in reducing the moral hazard in the process of technological innovation. The biggest advantage of the establishment of the credit evaluation system is clear rewards and punishments. Enterprises with good credit records can quickly obtain a large amount of funds, while those with bad credit records will be punished by reducing the loan limit or canceling the investment.

### **6.2. To Develop Credit Guarantee Institutions**

Medical technology innovation is a high-risk enterprise activity, if there is no effective risk compensation mechanism to resolve the risk, it will be transferred to financial institutions through credit delivery, reduce their enthusiasm for lending. Therefore, need credit guarantee system as support, policy-based credit guarantee system is the core of risk dispersion and management mechanism. We should establish credit guarantee risk compensation system as soon as possible.

On the one hand, we should introduce relevant laws as soon as possible and set up policy-based guarantee institutions and risk subsidy fund. On the other hand, we should vigorously support the development of private guarantee institutions and give practical preferential support policies.

To further improve the credit guarantee system combined with technological innovation, it is suggested to proceed from the following two aspects:

The government should formulate the corresponding development plan of the credit guarantee industry, improve the access mechanism of the credit guarantee industry, strengthen the risk control measures, and strengthen the supervision of the credit guarantee industry.

It is necessary to increase the support mechanism for this industry [8], such as government investment or shareholding, holding, providing certain subsidies and tax reduction policies for companies with perfect modern enterprise management system, and establishing a multi-level risk-sharing mechanism.

In order to establish a multi-level risk sharing mechanism, the government's financial discount policy or the government's tax preferential policy can be used to enhance the maximum risk limit of commercial banks and increase the credit scale of commercial banks to pharmaceutical enterprises. This can not only provide investors with a certain degree of risk compensation, but also provide investors with more information about the enterprise, and promote the implementation of the payment business and insurance compensation business when the enterprise defaults, so as to further reduce the risk of credit default of pharmaceutical enterprises. In addition, it can provide guarantee mortgage for pharmaceutical enterprises with low credit rating through guarantee institutions. Venture capital fund and angel fund can also share the investment risk of enterprises. In the mature stage, pharmaceutical enterprises can realize the horizontal sharing of investment risk through the securities market.

Through the above measures, the security of technological innovation credit funds can be improved and the risk of bank credit funds can be reduced.

In order to ensure the safety of funds and protect the interests of all participants, a third-party professional institution can be asked to test the qualification, strength and risk bearing capacity of the investee; When investing, the investor is required to provide a pawn that can avoid risks, such as real estate. The investment parties sign the information sharing agreement of capital flow, requiring the investor to use more than a certain amount (such as 1 million), a certain period of time to use more than a certain amount of funds (such as 2 million), must protect the investor's right to know in a timely manner; In addition, to regularly review the use of funds, circulation and other conditions of the investor, in order to protect investment rights and interests.

## **7. To Increase Support from National Policy-Based Financial Institutions**

Policy-based financial institutions refer to financial means adopted to achieve specific policy objectives such as industrial policies. Due to the spillover effect

and externality of medical technology innovation, it has the nature of quasi-social public goods. Besides the credit support from commercial financial institutions aiming at the pursuit of commercial profits, it also needs the support from policy-based financial institutions. The main task of policy-based financial institutions is to provide financial support for technological innovation of enterprises with loan interest rates and financing conditions lower than those of commercial banks.

By establishing professional policy financial institutions for high-tech development zones and science and technology industrial parks, large-scale financing can be provided for major national science and technology projects and major national science and technology industrialization projects. In addition, we will provide discount loans and key support for projects on transformation of scientific and technological achievements, industrialization of new and high technology, digestion and absorption of imported technology, and export of new and high technology products. In order to enhance the support of policy-based financial institutions for technological innovation, efforts should be made from three aspects: increasing direct financial input, innovating indirect input and establishing policy-based guarantee system as soon as possible [9].

### **7.1. Should Expand the Scope of Policy-Based Loans and Special Funds**

Credit guarantee and discount interest are widely adopted by governments around the world to support the financing of science and technology enterprises. Direct financial support for enterprises in the early stage is of great significance to solve the problem of insufficient R&D funds. At present, compared to our country many medical technology researches and development enterprises, policy loans and special funds are still very limited, and the number of enterprises which can benefit is very small.

### **7.2. To Continue to Develop Government Start-Up Guidance Fund and Pharmaceutical Industry Investment Fund**

The establishment of venture capital guide fund is an important means for the government to solve the financing problem of small enterprises in the period of entrepreneurship. By establishing a guide fund, the government will guide social funds to make equity investment in small enterprises in the start-up period, so as to solve the financing problem of small enterprises in the start-up period [10]. It will help to change the traditional support model of Chinese policy finance and drive and guide the social capital to gather the emerging industries. The pharmaceutical industry investment fund is also a highly operable and efficient platform which combines the current government resources and market forces. Selecting excellent professional institutions to manage and operate industrial funds in accordance with international standards and adopting market-oriented constraint and incentive mechanisms can ensure the quality and efficiency of government financial funds investment.

## 8. Conclusion

Fund support function is the most common function of the government in the process of technological innovation. The process of technological innovation needs a lot of manpower, material resources and financial support, and it is far from enough to rely on the investment in technological innovation subjects such as enterprises, universities and scientific research institutions. Moreover, the achievements of technological innovation will also produce huge social and economic benefits. As the beneficiary of technological innovation, the government has the responsibility and obligation to give certain financial support. Therefore, the government must give full play to its financial support function, through direct investment, financial subsidies, tax incentives and low-interest financing and other means, to provide the most direct and powerful impetus for the improvement of industrial technology innovation ability.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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