

The Choice of the Direction of China's Research Fund Management Policy in the New Era

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Abstract: This paper reviews the history of changes in China's scientific research funding management policy from 1949, and outlines the characteristics of scientific research funding management in the four phases from the initial establishment of the system, the trial reform, the comprehensive reform to the deepening reform. From material-heavy to human-heavy, and from fragmentation to systematization, and based on the logic of the change of scientific research funding management policy, it proposes the optimization direction of scientific research funding management policy for the current problems in the field of scientific research funding management, such as establishing the governance system of scientific research funding management, cultivating the professional talent team of scientific research funding, strengthening the risk supervision and management of scientific research funding, and emphasizing the target performance evaluation of scientific research funding.

Keywords: Research Funding; Policy Change; Reform Direction

1. Introduction

After the founding of New China, China learned from the planned scientific and technological system of the former Soviet Union, which was dominated by administrative management, and established a more complete scientific and technological system in a relatively short period of time. However, since the reform and opening up, with the changes in the domestic and international environment, the previous scientific and technological system began to reveal shortcomings such as rigidity and lack of vitality, so in order to promote the development of scientific and technological, China began to gradually reform

its scientific and technological system since the 1980s. The decision on the reform of the scientific system was issued in 1985, which not only reformed the appropriation system and vigorously promoted the collaboration between research institutes, design institutes, institutions of higher learning and enterprises, but also set up the national intellectual property protection system, the national natural science system, and the national scientific research system. Between March 1991 and June 1997, 52 high-tech industrial development zones were approved, and in 1995, the strategy of developing the country through science and education was established. In December 1997, the Chinese Academy of Sciences submitted a research report on the construction of a national innovation system, ushering in a new round of reform of the scientific and technological innovation system. At the same time, the pilot knowledge innovation project was launched, and the transformation of scientific research institutes into market players was also promoted. In 2003, the state began to organize and formulate the medium-term and long-term scientific and technological development plan, and in early 2006, it deployed important research tasks on medium-term and long-term scientific and technological development, and introduced a series of complementary measures. After 2013, China began to implement the innovation-driven development strategy, which is based on the "double-wheel drive" of scientific and technological innovation and innovation of institutions and mechanisms. The 2016 outline of the national innovation-driven development strategy specifies the goals and tasks of China's innovation-driven development by 2050.

At present, China is in the stage of in-depth implementation of innovation and development strategy, in the step-by-step time

nodes have set the corresponding strategic objectives, that is, to 2030 among the forefront of innovative countries, to realize the fundamental transformation of the driving force of development, and by 2050 to build the world's scientific and technological innovation power, which can be seen in the important position of scientific and technological innovation. The cause of scientific and technological innovation can not be achieved overnight, this road is a long way to go, and needs to be systematically promoted in the long term. As an important part of the scientific research funding management system, it should also be adjusted with the advancement of reform. As an important input and support of the state for the cause of scientific and technological innovation, scientific research funding largely affects the development of scientific and technological innovation. Without the guarantee of scientific research funding, scientific and technological innovation is like water without source. Therefore, by reviewing the history of China's financial research funding reform, this paper tries to find out the logic of it, provide practical accumulation and development law for promoting the mechanism reform, and put forward corresponding policy suggestions for reference.

2. Literature Review

In today's era, the importance of science and technology is self-evident, and the reform of the scientific and technological system is a strong impetus to promote the development of science and technology. In order to better promote the reform of scientific and technological system, the reform of scientific research fund management is a very important part. The research on the management of scientific research funding mainly focuses on the changes in the policy of scientific research funding management, the problems in the management of scientific research funding, the reform of the field of scientific research funding management, and the future direction of the management of scientific research funding.

2.1 Changes in Research Funding Management Policies

In today's era, the importance of science and technology is self-evident, and the reform of

the .Research on changes in research funding management policies has focused on the content of research funding systems at different stages.

By reviewing the history of China's research fund management policy reform in the decade of the new era, Zhang Yaofang (2023) explores the laws and logic based on the assumptions of economists, principal-agent theory and game theory. Meanwhile, he summarized the six aspects of the undertaking power of the project undertaking unit, cross-departmental supervision and synergy mechanism, target governance and matching of authority and responsibility, scientific research financial assistant team, retention of balance funds and the relationship between project leaders and collaborators, and put forward more attention to the improvement of the grass-roots governance capacity and the construction of the governance system, more emphasis on the fairness and scientificity of the comprehensive performance evaluation, and more emphasis on the role of the support of the big data and information system Recommendations ^[1]. Luo Jade and Yang Snap (2021) reviewed the development history of the mechanism of scientific research funding and the mechanism of scientific research funding management, and found the logic of the evolution of the scientific research funding policy, such as the goal changed from serving national security and promoting economic development to improving the core competitiveness of the country, the way of allocating scientific research funding changed from being led by the government finances to being co-allocated by the government and the market, and the focus of the management of scientific research funding changed from being bound by an external system to an internal system. Implies the concept of laws, and the evolution of scientific research funding policy revolves around the two principles of following the laws and improving efficiency ^[2]. Sheng Mingke (2018) found from the evolution of China's scientific research funding management policy that its concept, content, mechanism and other aspects have undergone profound changes, and this set of evolutionary logic has particularities and regularities, which can lay the foundation for the future policy direction, that is, optimizing the scientific research funding management policy oriented

to promoting the modernization of the national innovation governance system, and adhering to the concept of human-centeredness to improve the design of the scientific research funding management policy, adhering to the demand-oriented optimization of scientific research funding management policy content as well as gradually improving the scientific research funding management policy system with systematic thinking^[3]. Ye Qingsong et al. (2016) summarized the history of changes in the national level of scientific research fund management policy. In 2001, China's scientific research system management entered a new stage, from 2006 to 2010, indirect cost compensation represented by "management fee" began, and from 2011 to 2015, the state clarified the indirect cost compensation mechanism and regulated the use of funds. Between 2011 and 2015, the state clarified the compensation mechanism for indirect costs, and strictly supervised the use of funds^[4]. Li Yanping et al. (2009) studied China's scientific research funding management policy under the framework of institutional change theory through content analysis, and found that the scientific research funding management policy in the transition period had many different policies, and the development had a stage, which were the groping stage (1985-1994), the establishment stage (1995-2005) and the sound stage (2006-2007). At the same time, the universality of policies has gradually increased, and the guidance and operability of policies have been strengthened. In terms of policy environment, most of the policies were supporting measures under a certain science and technology development program, and after the establishment of the independent innovation strategy, the government strengthened the adjustment and amendment of the management mode of scientific research funding. In terms of management principles and policy value shifts, attention has begun to focus on more scientific and precise macro-control. Meanwhile, in terms of the use of policy tools, it has gradually transitioned from a crude to a refined approach, and has carried out a more scientific and reasonable system design. Commitment and credit management mechanisms have also been introduced, paying more attention to the value orientation of scientific researchers' integrity and self-discipline^[5].

2.2 Problems in the Management of Research Funds

In the process of changing the management of research funding, its internal logic is to solve the problems in the management of research funding.

Xu Fang and Li Xiaoxuan (2022) proposed that although the government has adopted a series of loosening reforms in the management of scientific research funding, so that researchers have a real sense of obtaining, there are still problems such as the government's decentralization of scientific research units did not fully assume their own responsibilities and the lack of coordination between the policies introduced and the standards of inspection and audit^[6]. Li Kui and Zheng Qiusheng (2016) analyzed the reform of the scientific research funding management system and its existing contradictions based on the perspective of the management of institutions, respectively, the stimulating effect of scientific research funding on the enthusiasm of both internal and external personnel is limited, the implementation of the centralized payment of scientific research funding in the state treasury restricts the autonomy of the use of the funds, the establishment of a ceiling on the performance pay of the institutions frustrates the enthusiasm of researchers, and the centralized procurement system of the government under the equipment and materials may have a gap with the actual scientific research^[7]. Liu Junmin (2014) found the following problems in the use and management of scientific research funding: first, the compensation of scientific research human capital by scientific research funding is insufficient; second, the sustainability of indirect costs is poor, there is a lack of dialogue and negotiation mechanisms, and the low rate of indirect costs does not adequately supplement the actual labor of researchers; third, the budgeting of scientific research funding is irrational, the costing of projects is unclear, and there is a management disconnect between the project, the budget, and the finance; and fourth, the management of scientific research is not in harmony with the actual labor of researchers. management disconnect; fourthly, the supervision of scientific research funding is relatively loose; fifthly, the balance of scientific research

funding is left idle ^[8]. Yao Yupeng (2011) suggests that during the period after China formally established the Natural Science Foundation in 1986, scientists' motives for seeking funding were relatively pure and mainly centered on research work. However, after the enterprise-based restructuring of the institution in 1999, although it could substantially increase the income of researchers, the competitive research funding linked to the results also increased the survival pressure of researchers ^[9]. Xue Yaling (2011) found the following problems in the management and use of scientific research funding: first, a single scientific research funding management system cannot adapt to different situations; second, the distribution of scientific research funding is unreasonable and unbalanced; third, the purpose of obtaining scientific research funding and the value orientation has become profit-seeking; fourth, the preparation of funding budgets is unscientific and inaccurate; fifth, the management of the project and the management of the funding are disconnected from each other, and they cannot be organically integrated; sixth, the scientific research department and the equipment and facilities can not be integrated; sixth, the research department and the equipment and facilities can not be integrated with each other. Fifth, project management and fund management are disconnected from each other and cannot be combined organically; Sixth, research funds are wasted due to the lack of linkage between research departments and equipment management departments; Seventh, to a certain extent, the system of scientific research fund management fails to fully recognize the value of the labor of scientific researchers ^[10].

2.3 Reforms in the Field of Scientific Research Funding Management

Different stages of development have different characteristics and different goals. When the goals are adjusted, the previously functioning system of research fund management may be exposed as unsuitable. Therefore, in order to better serve the national strategic objectives at different times, the research fund management system needs to make adaptive changes.

Zhao Liyu et al. (2021) analyzed the logical motivation of the reform by exploring the

evolution of the science and technology system and the evolution of the scientific research funding management policy, such as the existence of the imperfect budget management system of scientific research funding, the difficulty of implementing some of the decentralization policies, the lack of enhancement of the sense of obtaining of the researchers as well as the lack of supervision of the unit responsible for the scientific research project, and designed, after summarizing the decentralized and centralized management modes of the developed countries, a The promotion mechanism of the reform of China's scientific research funding package system, i.e., assessment, incentive, fault tolerance, audit and supervision, prevention, control and early warning, and multicenter governance mechanism, and put forward the suggestions of promoting the flexible management of scientific research funding, fully decentralizing the governmental management, clarifying the rights and responsibilities of scientific researchers in the management of scientific research funding, and strengthening the supervision of the management of scientific research funding ^[11]. Wang Shoujun (2019), by briefly describing the changes in the management policy of scientific research funds and by analyzing the problems in the process of using and managing scientific research funds, i.e., budgeting and approving, purchasing and paying, reviewing and reimbursing, and auditing and accepting, probed into the reasons behind the management ideas and the management policy, and put forward the outlook of policy optimization ^[12]. Hu Yongjun (2015) argued that the reform of the national research fund management policy between 2011 and 2015 focused on the three key issues of indirect costs, budgeting and adjustment, and balance funding. In general, this reform highlights the main position of project undertaking units and project leaders, and pays more attention to the establishment of a credit management system and regulatory mechanism.

2.4 Future Direction of Research Fund Management

As an important part of the reform of the scientific and technological system, the management of scientific research funding should also keep pace with the times, and

constantly adjust and change with the development of the times.

Some scholars believe that it is necessary to differentiate the provision of research funding for different research funding recipients. Duan Peixin et al. (2022) analyzed the heterogeneity of the impact of increased research funding on research output from three aspects, namely, the experience of the project leader, the relying unit, and the team size. Finally, they concluded that research funding should be differentiated, and gradient and diversified funding should be carried out for different groups of people and different platforms^[13]. In the management concept of scientific research funding, Tai Shuangbian (2017) believes that the management of scientific research funding should increase flexibility, not by "blocking" but by "dredging". Specific problems should be analyzed, and rigid systems should not be used to restrict^[14]. In the supervision of scientific research funding, Li Kui and Zheng Qiusheng (2016) believe that the management system of scientific research funding has shown three changes, one is that the management system of scientific research funding has a higher and higher status in the scientific research system, the second is that the relevant regulations are constantly loosened, and the third is that the center of gravity is shifted from things to people, and more and more attention is paid to the role of talents. In improving the autonomy of scientific research institutions to improve the use of funds to enhance the enthusiasm of scientific research at the same time, but also to improve the management and supervision mechanism to increase the punishment, and from the process of management to the target management change, more emphasis on the use of funds performance^[7]. The use of funds to emphasize the performance. Liu Junmin (2014) believes that a way to improve the human capital compensation for scientific research, the implementation of full-cost accounting of scientific research projects, the expenditure of allowances and labor costs in the direct costs, and the promotion of personnel performance expenditure policy; secondly, we should increase the autonomy of the use of funds; thirdly, we should establish a mechanism to evaluate the performance of scientific research funds; fourthly, we should enhance the transparency of the scientific

research budget; fifthly, we should strengthen the supervision of scientific research funds; sixthly, we should reform the management of the balance of scientific research funds. management of scientific research funding balances^[8]. Xue Yaling (2011), on the other hand, suggests to improve the management system of scientific research funding, the system of evaluating the effectiveness of scientific research funding, and the system of funding scientific research achievements at a later stage^[10].

3. The History of Changes in Research Funding Management Policies

There are four key time points in the reform of China's science and technology system related to the management system of scientific research funding, namely the founding of New China in 1949, the convening of the National Science Conference in 1978, the issuance of the Decision on the Reform of the Science and Technology System in 1985, and the issuance of the Decision on the Implementation of the Outline of Science and Technology Planning for Enhancing the Capability of Independent Innovation in 2006. Accordingly, the change process of China's scientific research funding management can be divided into four stages: initial establishment (1949-1977), reform trial (1978-1984), comprehensive reform (1985-2005) and deepening reform (2006-2023).

3.1 Initial Establishment of the Research Fund Management System

From the founding of New China to the reform and opening up of China, China's economic system has been a highly centralized, collect-and-spend planned economy. In line with this, the management of scientific research funding was based on the scientific and technological plan, with priority given to guaranteeing and supporting major national strategies and scientific research projects for the development of the national economy. At that time, our country was in the midst of a period of rapid development, with limited resources, and this mode of scientific research funding management gave full play to the advantage of centralizing power to do great things. However, under the highly centralized power of fund management, the lack of competition, responsibility, reward and punishment mechanism, and the weak constraints led to the

arbitrary expenditure of funds. At the same time, due to the planned economy only considered the cost of consumption of goods and ignored the creation of human value, we do a good job or bad job is the same, there is a big pot of rice situation, so such a model is a drawback, is unreasonable. In addition, there is a lack of connection between departments, and there is also a disconnection between production and scientific research.

3.2 Pilot Reform of Research Fund Management

With the reform and opening up in 1978, the focus of work shifted to economic construction, and funding for science and technology was strengthened. However, due to the high degree of centralization of fund management and the arbitrariness of fund expenditure in the planned economy, the autonomy of fund management began to be decentralized, and the mechanism of responsibility, reward and punishment began to be implemented as a means to compensate and motivate the enthusiasm of scientific researchers. 1982, in order to emphasize the great role of science and technology in promoting economic development, in October of the same year, the strategic guidelines were put forward, "science and technology work must be oriented to economic construction, and economic construction must rely on science and technology". The work of science and technology must be oriented to economic construction, and economic construction must rely on science and technology. Since then, the reform of scientific research funding in line with the development of science and technology has begun, with the introduction of the budget lump-sum system and the pilot paid contract system. The budget lump-sum system gives scientific research institutions full authority to coordinate funds, strengthens the sense of authority and responsibility in the use and management of scientific research funds, and improves the efficiency of use. The system of reimbursable contracts mobilizes the scientific research enthusiasm of all parties, promotes the integration of science and technology with the economy, and facilitates the transformation of scientific and technological achievements.

3.3 Comprehensive Reform of Research

Fund Management

The 1985 decision on the reform of the science and technology system marked the beginning of the full-scale reform of the science and technology system, and the goal of the reform of the management of scientific research funds at this time was to reform the parts of the science and technology system and the mechanism for the management of scientific research funds that were not compatible with the economic system. It mainly included the following aspects: first, reducing the allocation of utility fees and categorizing the management of funds; second, continuing to expand the independent use of funds management; third, giving full play to the government's power and introducing market factors such as the competition mechanism; and fourth, the implementation of the subject project system. At the same time, a performance assessment mechanism for the management of scientific research funds has been gradually established to standardize the management of scientific research funds.

3.4 Deepening Reform of Research Fund Management

In 2006, China put forward the strategy of independent innovation and the construction of a national innovation system, and in order to meet the needs of improving the country's competitiveness, the reform of scientific research fund management has entered a period of deepening. The sense of performance in the management of scientific research funds has been further strengthened, and many measures for the management of scientific and technological programs and special funds have been introduced one after another.

After the innovation-driven development strategy was put forward in 2012, the whole-process management of scientific research project funding was strengthened, and the transparency of the process of using project funds from project initiation to project completion was increased. However, the overly detailed management inhibited the initiative and motivation of the main body, so after 2016, the management of scientific research funding more reflects the idea of simplification and decentralization. It not only simplified the funding management process, but also expanded the funding autonomy of

scientific research institutions, showing a shift from rigid to flexible management.

4. Options for the Direction of Research Fund Management Policy

In the process of China's scientific research funding management policy change, the concept of scientific research funding management has shifted from focusing on things to focusing on people, and from refinement to scientization. Although the concepts guiding the management of scientific research funding are progressing, there are still problems in the management of scientific research funding in practice, such as the implementation of the policy by scientific research units needs to be strengthened, the synergistic mechanism between departments needs to be perfected, the enhancement of performance evaluation needs to be researched, and the professional scientific research financial assistants need to be cultivated, and so on. By reviewing the history of changes in China's scientific research funding management policy and following the logic of the evolution of scientific research funding management policy, the future reform of scientific research funding management will certainly be more comprehensive and can be carried out in the following aspects.

4.1 Establishment of a Research Fund Management Governance System

4.1.1 Establishment of a polycentric governance mechanism for research fund management

China's research funding management lacks a complete and clear set of standardized system, which leads to confusion in research management. In order to ensure the effective implementation of scientific research funding management policies, top-level design should be strengthened and a multi-center governance mechanism between different subjects and departments should be established. On the one hand, a communication and coordination mechanism for different subjects should be built between the government, universities and subject leaders. On the other hand, a synergistic governance mechanism of different departments is built between finance, audit, science and technology. The two-pronged approach achieves the effect of coordinating research on common problems and discussing

solutions together.

4.1.2 Enhancement of digital governance of research fund management

The digitization of scientific research funding management has put forward higher requirements for big data and information technology, which is the key to improving the effectiveness of scientific research funding management. First of all, a standardized system of big data and information system for scientific research funding should be established to unify the standards of data and information and regulate their use, so as to provide technical support for decision-making in the field of scientific research funding. On this basis, an informatization platform for scientific research fund management should be established to make full use of big data to supervise and manage scientific research funds, so as to ensure the rational use of scientific research funds.

4.1.3 Simplified budgeting requirements for project research funding

When preparing project budgets, the requirements for budgeting are simplified and overly detailed measurements are not required at the initial stage. Because scientific research activities are an unknown process and the use and management of funds need to be adjusted in line with changes in scientific research activities, it is difficult to prepare an overly detailed budget at the initial stage, which is also not practical enough.

4.2 Cultivating a Team of Research Funding Professionals

4.2.1 Enhancement of specialized knowledge training on research funding

Researchers focus on solving technical problems, while the management of funds should be done by professional research financial assistants, which can reduce the non-academic burden of researchers. However, in practice, project teams often hire non-professional financial staff, such as students, administrative staff, etc., which lacks the professionalism of fund management. Therefore, it is necessary to train the professional knowledge of research fund managers to make the fund management more scientific.

4.2.2 Clarify the authority and responsibility of research fund managers

Before fully delegating authority to researchers,

the responsibilities of researchers in the management of research funding should first be clarified. Generally speaking, the project leader has direct responsibility for the use of funds, such as the progress of completion of funds. But at the same time, they also have the right to make corresponding adjustments to the use of funds. Only under the premise of clear rights and responsibilities, rewards and punishment mechanism can have specific implementation of the target object, which is also the effective supervision and management of scientific research funds.

4.2.3 Full decentralization of research funding
The traditional rigid management mode of scientific research funding constraints on the enthusiasm of researchers, the flexible management of scientific research funding can give researchers full power of funds. But decentralization needs to be adequate and moderate, to avoid the situation of "a loose, a tube is dead". At the same time, under the full decentralization, researchers are naturally burdened with heavier responsibilities. However, due to the long cycle of scientific research activities, researchers are often unable to guarantee the results of scientific research, subject to the influence of uncertainty, researchers within a certain range of error is very normal, so the need to establish a clear and flexible fault-tolerance mechanism, which is also under the decentralization of the release of scientific researchers to ensure that the enthusiasm of researchers.

4.3 Strengthen the Supervision and Management of Research Funding Risks

4.3.1 Strengthening risk prevention and control of research funding

Potential risks in the use of scientific research funds may adversely affect the implementation of the project, so the establishment of a risk prevention and control mechanism is very necessary. The first step is to identify the risk, in all aspects of the risk should be found and focus on the risk found. The next step is to assess the risk, can set the level of risk and provide appropriate preventive measures. Finally, it is necessary to pay attention to risks dynamically, to understand the changes in the risk situation, and to make timely responses, so as to achieve the dynamic management of risks in the whole process of the use of funds.

4.3.2 Improve the supervision and

management system of scientific research funds

First of all, a clear principle of supervision of scientific research funds should be established to prevent and eliminate corruption and waste in the use of funds, and then carry out supervision on this basis. In order to accept wider supervision from internal and external sources, it can be considered to publicize the information related to scientific research funds such as the budget statement and the pre-application work of the project. At the same time, a reward and punishment system and an audit system should be set up to match the supervision system, so as to improve the efficiency of the use of funds.

4.4 Emphasize Performance Evaluation of Research Funding Objectives

4.4.1 Scientific evaluation of the effectiveness of the use of research funds

Evaluation criteria for the effectiveness of the use of scientific research funds are scientifically determined, and evaluation levels are set with technical criteria as the main criterion. It is supplemented by other criteria, such as financial evaluation, rational use of funds and budget management compliance. For example, a sound financial system, rational use of funds, and budget management compliance can be considered for a high rating, and high-rated research projects can receive more policy preferences in the use of research funds.

4.4.2 Focus on the effectiveness of research funding outputs

Outputs are a concrete expression of the results of the use of research funds, and an increase in research funds can improve the quantity and quality of research outputs and enhance research performance. In order to strengthen the target performance orientation and produce results with high standards of research quality and value, and to change the idea of "emphasizing the process, emphasizing the establishment of the project, and emphasizing acceptance", we can consider introducing a third-party acceptance system, which will include all stakeholders in the evaluation body, increase the degree of importance, and form the power of control. For scientific research projects with excellent performance evaluation, follow-up supporting incentive policies will be given.

5. Conclusion

Scientific research funding plays an indispensable role in supporting scientific research activities, while scientific research funding management policies serve the corresponding development goals at different stages. The change of scientific research fund management policy follows its internal logic, experiencing the transformation from material to human, from fragmentation to systematization, and evolving in the direction of scientification, standardization and institutionalization. However, in the process of policy change, problems are going to appear continuously. In view of the problems in the field of scientific research funding, the choice of the direction of scientific research funding management policy should be to establish a governance system for scientific research funding management, to cultivate a team of scientific research funding professionals, to strengthen the risk management and supervision of scientific research funding and to emphasize the target performance evaluation of scientific research funding.

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