

Research on Fiscal Decentralization, Local Government's Behavior Preference and Technology Investment Efficiency—Based on Chinese Practice

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Abstract

The starting point of the fiscal decentralization theory is the efficiency of public goods supply. As one of the major public investment projects of the government, science and technology investment has a great impact on the development of the country and the people's life. Therefore, based on the practice of Chinese fiscal decentralization, this paper tries to reveal the effect of fiscal decentralization and local government's behavior preference on science and technology investment efficiency by normative analysis. Through research, it has been found that technology investment requires a huge amount of money and time to produce results. So it is not easy to achieve results in the short term. Under Chinese-style fiscal decentralization, the lack of institutional constraints and reasonable officials' assessment indicators has led to the alienation of local government's behavior preference and the loss of the efficiency of science and technology investment.

Keywords

Fiscal Decentralization, Government's Behavior Preference, Technology Investment Efficiency

1. Introduction

History shows that the revolution of science and technology can have a profound influence on the world development pattern. Since the reform and opening up, China's investment in science and technology has been increasing, and the government has been playing an increasingly significant role as an important

source of investment for science and technology. In recent years, the Chinese government has continuously increased its fiscal expenditure in the field of science and technology. The government's expenditure on science and technology grew from 8.62 billion yuan in 2002 to 776.07 billion yuan in 2016, an increase of 8.5 times. In 2016, the expenditure increased 75.49 billion yuan month by month, a 10.7% increase (Data source: *China Statistical Yearbook on Science and Technology* from 2003 to 2017). With the reform of China's fiscal decentralization system, more and more government power is devolved to local governments, and local governments have assumed a more important role in science and technology investment. In 2002, local government's investment in science and technology accounted for 37% of the government's investment in science and technology, and increased to 58% in 2016, a 21% increase. (Data source: Calculated according to the *China Statistical Yearbook on Science and Technology* from 2003 to 2017). Fiscal decentralization lets local governments take more responsibility on fiscal expenditure when they have greater autonomy in fiscal revenue. Therefore, local governments face a "prudent" choice in the direction of expenditure.

Scholars' research shows that under the background of China's fiscal decentralization system, governmental actions such as "Government Competition" and "Championship of Officials' Promotion" based on GDP assessment have significantly promoted the supply of economic public goods and restrained the supply of non-economic public goods. These have led to the distortion that Chinese local governments emphasize on infrastructure while reducing human capital investment and public services. In the related research, scholars tend to classify government investment in science and technology as a class of non-economic public goods such as education, culture, and so on. Because technology and education are closely related to the important ways of "human capital" accumulation, this research method has its rationality and feasibility. However, as the public product that can make a tremendous contribution to economic growth, science and technology investment should be classified into the category of economic public goods in nature. The research method of classifying science and technology investment into non-economic public goods may obscure the true mechanism of the effect of fiscal decentralization and government's behavior preferences on the efficiency of science and technology investment. This means that we should conduct a more detailed and comprehensive investigation of the relationship between the local government's behavior preference and the efficiency of science and technology investment under the fiscal decentralization background of China.

The following parts of this article are arranged like this: the second part provides related literature review; the third part is about the nature of public goods of scientific and technological achievements; the fourth part concerns the nature of local government; the fifth part is the conclusion of this paper and policy suggestions; the last part tells about the main contributions and limitations of

this article, and some suggestions for further research.

2. Literature Review

Scholars' research on the theory of fiscal decentralization mainly focuses on the relationship between fiscal decentralization and some factors, such as the supply of public goods (Hayek, 1945 [1]; Tiebout, 1956 [2]; Stigler, 1957 [3]), economic growth (LinYifu, Liu Zhiqiang, 2000 [4]; Yin Desheng, 2004 [5]), government scale (Zhuang Yuyi, Zhang Guang, 2012 [6]), local debt (Jia Kang, *et al.* 2010 [7]) and transfer payment (Liu Guangjun, Zhou Yuxi, 2013 [8]), etc. The research on the allocation efficiency of public goods under the fiscal decentralization is the starting point and end-result of fiscal decentralization theory (Fu Yong, 2010) [9]. The traditional theory of fiscal decentralization holds that local governments know more about the preferences of public goods than the central government, which can provide more desirable public goods (Stigler, 1957) [3]. At the same time, under the influence of "Foot voting" and other mechanisms, decentralization has prompted local governments to conduct "scale competition", and competition brings about the improvement of the supply efficiency of public goods (Tiebout, 1956) [2]. Qian Yingyi *et al.* (1998) [10] introduced the incentive compatibility and mechanism design theory into the fiscal decentralization theory. Scholars at home and abroad gradually adopt the political economy method, and applied the "economic man" hypothesis into the analysis of the economic relations between governments. Scholars shifted fiscal decentralization research focus from the supply of public goods to the mode of local government's behavior and advocated that the government should be effectively restrained in order to increase the efficiency of local government in the supply of public goods under the fiscal decentralization. This is also the separation of fiscal decentralization from "first generation" to "second generation".

The discussion and research on the behavior preference of local government in China is based on the Chinese "Chinese fiscal decentralization". Scholars discovered the phenomenon that Chinese local governments emphasize infrastructure, reduce human capital investment and public services and analyzed the causes of local government's behavior preference from the following aspects: fiscal power and authority do not match; the transfer payment system is unreasonable; lack of budget constraints; "Government competition" and "Championship of Officials' Promotion" based on GDP assessment. There are many normative and empirical research results in this area.

Scholars' research on science and technology investment mainly concerns the relationship between science and technology investment and economic growth, the influence of government's behavior preference on local government's investment in science and technology, etc. At present, the relationship between science and technology investment and economic growth has been relatively clear explanations, foreign scholars Romer (1990) [11], Grossman and Helpman (1991) [12] have proved that the increase in R&D investment will increase the

speed of economic development based on R&D endogenous growth model. The contribution of science and technology to economic growth has also been demonstrated in different ways. When it comes to the influence of government's behavior preference on local government's investment in science and technology, Scholars mainly elaborated from the perspective of empirical research. Zhou Keqing *et al.* (2011) [13], by defining and dividing the types of technology investment at different levels, found that the overall financial decentralization is beneficial to the improvement of the level of science and technology investment of local governments. However, Xie Qiaoxin and Song Liangrong (2015) [14] found that the level of R&D investment of enterprises in the jurisdiction with higher degree of decentralization was lower. Bai Junhong (2017) [15] analyzed the different influence mechanisms of revenue perspectives and expenditure perspectives on local government's S&T investment under fiscal decentralization, and explained why the application of different fiscal decentralization indicators may lead to opposite conclusions. Scholars' research results on the influence of government's behavior preference on local government's investment in science and technology are rich. Gu Yuanyuan and Shen Kunrong (2012) [16] research shows that due to the unreasonable institutional arrangement, and bias in the competition of local government incentives guided (Government Competition and Championship of Officials' Promotion based on GDP assessment), fiscal decentralization suppresses the local government investment in science and technology; Pan Zhen *et al.* (2013) [17] empirical research shows that the local government's technological investment has been weakened by the regional competition based on fiscal decentralization. Zhang Liangliang *et al.* (2016) [18] examined the temporal and spatial characteristics of the local government's science and technology investment behavior and found that the local government's technology investment strategy has significant continuity, but the year-on-year increase is limited. Local government competition has a significant counter-regulatory effect on the distortion of the structure of science and technology investment. Bian Yuanchao *et al.* (2017) [19] discusses two behavior preferences of local governments, "Competition for Growth" and "Competition for Innovation", and found that their formation mechanism and their impact on science and technology investment are different.

It is known from the literature review that there are abundant research results on fiscal decentralization, local government supply preference and related problems, and the theoretical framework is clear. However, the research is still insufficient, for example, lack of targeted research on local government Science and Technology Investment, more attention to quantity than efficiency of Science and Technology Investment, etc. So this paper takes the efficiency of local government's science and technology investment as the focus of research, and attempts to reveal the mechanism of China's fiscal decentralization, local government's behavior preferences, and the impact of science and technology investment efficiency.

3. Are the Scientific and Technological Achievements Economic Public Goods or Non-Economic Public Goods?

Are the scientific and technological achievements economic public goods or non-economic public goods? This is a matter of great concern to us. But before that, we must first clarify what kind of public goods the scientific and technological achievements are, “pure public goods” or “quasi-public goods”.

“Public goods” is a concept corresponding to “private goods”, and its consumption has non-competitive and non-exclusive characteristics, which cannot be effectively provided by enterprises and individuals through the market mechanism in general. It is mainly provided by the government. The first type of the public goods is pure public goods, which are both non-exclusive and non-competitive. The second type of public goods is characterized by non-competitive consumption, but it can easily be excluded. Some scholars refer to such items as club goods. The third type of public goods is just the opposite of club goods, that is, they are competitive in consumption, but they cannot be effectively excluded. Some scholars call such goods as common-pool resources. Club goods and common-pool resources are called “quasi-public goods”, which means they are non-exclusive and non-competitive at the same time. Quasi-public goods generally have the characteristics of “crowding”. That is, when the number of consumers increases to a certain value, the marginal cost is positive. But the pure public goods are different, when increase one person’s consumption, marginal cost is zero. After the quasi-public goods arrive at the “crowded point”, each additional person will reduce the utility of the original consumers. The classification of public goods and the characteristics of “crowding” of quasi-public goods provide a theoretical basis for us to explore the multiplicity of public service products.

The output of technology investments is called “scientific and technological achievements.” They are a type of public goods that have a material form represented by papers, monographs, reports, techniques, formulas, etc., as a result of knowledge, technology, and other intellectual work. The greatest value of scientific and technological achievements lies in the intangible part of the creation of mental labor. Unless new technology is replaced to make technology obsolete or invalid, they can exist indefinitely and can be used indefinitely. Thus, the use of scientific and technological achievement by individual consumers will not reduce anyone, including the number of contemporary and future generations. Therefore, it has the “non-competitive” consumption.

In the “non-exclusive” aspect, due to the differences in the form of its existence, the exclusivity costs of different scientific and technological achievements are different. Scientific and technological achievements have strong positive externalities. Researchers such as Gerry Chester found that the social return rate of scientific and technological achievements is as high as 40% - 60%, which is far greater than the private rate of return and social returns of other industries. This leads to the private sector does not have insufficient incentives to engage in

scientific and technological activities, resulting in insufficient investment in the entire society and science and technology. This provides reason for the government to participate in scientific and technological activities. Exclusivity costs and externalities of scientific and technological achievements will lead to different levels of government involvement in science and technology activities. In general, the higher the exclusive cost of scientific and technological achievements, the stronger the externalities and the higher the level of government involvement.

According to Wu Biying's research (2012) [20], the technological achievements can be further divided into three types according to the size of exclusive cost in the use of scientific and technological achievements:

First, "Basic Research and Technological Achievements". Basic research has nothing to do with industrial and commercial purposes, is to obtain new knowledge about phenomena and observable facts for the purpose of theoretical or experimental work, it is not for the purpose of any special or specific application of science and technology activities. The output of such scientific and technological activities is usually published exclusively, academic papers, etc., which cannot be protected in the form of patents. Any department or individual can use it for free. Therefore, the scientific and technological achievements of basic research can overflow completely, and the exclusive cost tends to infinity. Therefore, the scientific and technological achievements of basic research belong to pure public goods.

Second, "Generic Technology". The definition of generic technology was first reported by the bush administration. Generic technology refers to those scientific facts that have potential opportunities and can be used in a variety of products and industries. The main manifestations are technology composition, product technology, scientific concepts, and scientific and technological investigations. Patented technology manifests itself as formulas, test products, processes, procedures, etc., all of which are relatively specific forms of expression. This makes generic technology unable to obtain property protection through patent applications. Therefore, the exclusive technology has a higher exclusive cost. The generic technology has certain pertinence in the use process. It is not open to the whole society, so the exclusive cost of the generic technology is lower than the basic research. Generic technology can be applied to the production of a variety of industries, a variety of products, so the generic technology has strong externality. The externality of generic technology lead to a single enterprise of generic technology investment's enthusiasm is not high, and the result is that the entire society's common technical funding is insufficient. However, the generic technology cannot be unlimited exclusive, and the ingenious system design and policy restriction can reduce its externality, thus reducing the exclusivity cost. Practice around the world show that generic technology is competitive technology based on cooperation. Therefore, generic technology is similar to club goods and belongs to quasi-public goods.

Third, "Proprietary Technology". Up to now, there is no accepted definition

of proprietary technology. In 1964, the international intellectual property organization defined proprietary technology as: proprietary technology refers to the knowledge related to the invention and manufacture of technology and the use of technology. The modern economic law dictionary defines proprietary technology as a certain value, is not known to the public, can transfer or authorized, has not obtained the experience, methods of the patent right and technical knowledge, etc. In a word, proprietary technology is the sum of secret skills, experience and technical knowledge, which can be written information, such as design scheme, data, and operation guide, etc. It can also be a demonstration of technology, oral transmission, etc. The proprietary technology itself mainly refers to the concepts and ideas in the knowledge of skills, experience and technology. Proprietary technology can be protected in the form of trade secrets or patent applications, thereby reducing the exclusive cost of proprietary technology. Therefore, proprietary technology has the lowest exclusive cost and is relatively close to private goods.

In the end, in order to explore the most effective supply subject of the three kinds of scientific and technological achievements, the investment cost and return period size of the three types of scientific and technological achievements need to be analyzed. This is because investment costs and returns are important factors for market players to make investment choices. Among them, major scientific research projects have the characteristics of huge investment, long research period, time-consuming and high risk. Rational market players are reluctant to invest, and they prefer to rely on existing mature technologies to produce products. Therefore, funds for basic research and generic technology should be provided mainly by the government. Scientific and technological researches at the experimental and development stage are conducted on the basis of mature scientific and technological theories. The risk is small, and the obtained results can be directly applied to production and obtain economic returns. For companies, there is a great deal of motivation to invest, so the investment in technology is provided by companies that can produce more efficiency.

4. Are Local Governments “Benevolent” or “Economic”?

Under the traditional fiscal decentralization theory, the government is regarded as the benevolent man with “public reason” who aiming at maximizing social welfare and does not pursue individual interests. In the country, the central government plays the role of management and decision-making. Because of its standing at a certain height to make decisions, avoid the weaknesses of individual decision-making, such as short-sighted, blind, and can concentrate on the big issues. The local government provides public goods in accordance with the principle of the beneficiary based on the results of residents’ “Foot voting”. The behavior preferences and actions of the benevolent man are as follows:

The “benevolent” local government—public reason—seeks the maximization of social welfare—response action: subject to local preferences and central gov-

ernment policy orientation.

A new generation of fiscal decentralization theory follows the guiding principle of the traditional theory, but to give up the traditional theory of fiscal decentralization of government in social welfare maximization as the goal of hypothesis, the “economic man” hypothesis is applied to the analysis of the economic relationship between the governments. Therefore, the government, as the economic man of “private reason”, aims at realizing its maximization. There is a spontaneous “leviathan” (expansively) and competitiveness, which provides public goods in accordance with the outcome of the “regulation system” and the “own development” game. The behavior preferences and actions of the economic man are as follows:

The “economic” local government: private reason—pursuing self-interest maximization—*independent action*: pursuing short-term and political interests.

To sum up, the local government has dual identity, and it produces response action and independent action, and two different behavior preferences. In the context of China’s fiscal decentralization and political centralization, local governments have dual identity and dual behavior preference. On the one hand, the local government as “benevolent man” based on public reason, according to the social welfare maximization principle, to respond to the central and local residents, which comply with the guide of the central government and local residents and choice. In this case, whether the local government can give play to the efficiency advantage of public goods supply efficiency lies in whether the orientation of the central government is correct and whether residents can play the role of “Foot voting”. On the other hand, the local government as based on private rational “economic man”, in the pursuit of maximizing the interests of the individual to make independent behavior under the domination, namely the pursuit of government scale expansion and promotion competition. This behavior will be affected by laws and regulations and the supervision of the local residents and constraints, and its inhibitory effect on local government supply efficiency advantage mainly by the perfect degree of the laws and regulations and the impact of officials’ promotion evaluation indicators.

According to the research of scholars, top-down official selection system in parts of China don’t have to be “kindness” to maintain social justice, the migration of strict household registration system and high cost of blocking the implementation of “Foot voting” mechanism (Ma Wanli, 2015) [21], which makes the government’s “benevolent” decay and “economic” strengthen. In this case, although the central government’s policy orientation on the development of economy and science and technology has provided positive incentives for local government’s investment in science and technology, due to Government Competition and Championship of Officials’ Promotion based on GDP assessment, makes the local government will attach more importance to the growth of the short-term economic performance, thus bias towards investment effect, faster infrastructure projects such as public investment, compression technology in-

novation, etc. It is also the reason that technology, as economic public goods, has insufficient supply scale and efficiency.

5. Conclusion and Policy Suggestions

Through research, it has been found that technology investment requires a huge amount of money and time to produce results. So it is not easy to achieve results in the short term. Under Chinese-style fiscal decentralization, the lack of institutional constraints and reasonable officials' assessment indicators has led to the alienation of local government's behavior preference and the loss of the efficiency of science and technology investment, as shown in **Figure 1**.

The government plays a vital role as laying the foundation for and guiding the development of science and technology. In the context of fiscal decentralization, it is suggested to improve China's fiscal decentralization system from the following aspects, so as to improve the efficiency of local technology investment.

First, promote the "supply-side" reform of government science and technology investment. When investing in science and technology, the government should increase or decrease investment at proper times and optimizes the structure of technology investment. The government should increase investment in basic scientific research, support applied research, encourage experimental development, and guide enterprises and other market entities into entering the world of research and development in science and technology. At the same time, it is necessary to re-examine the responsibilities of the central and local governments in terms of scientific and technological investment, and make clear

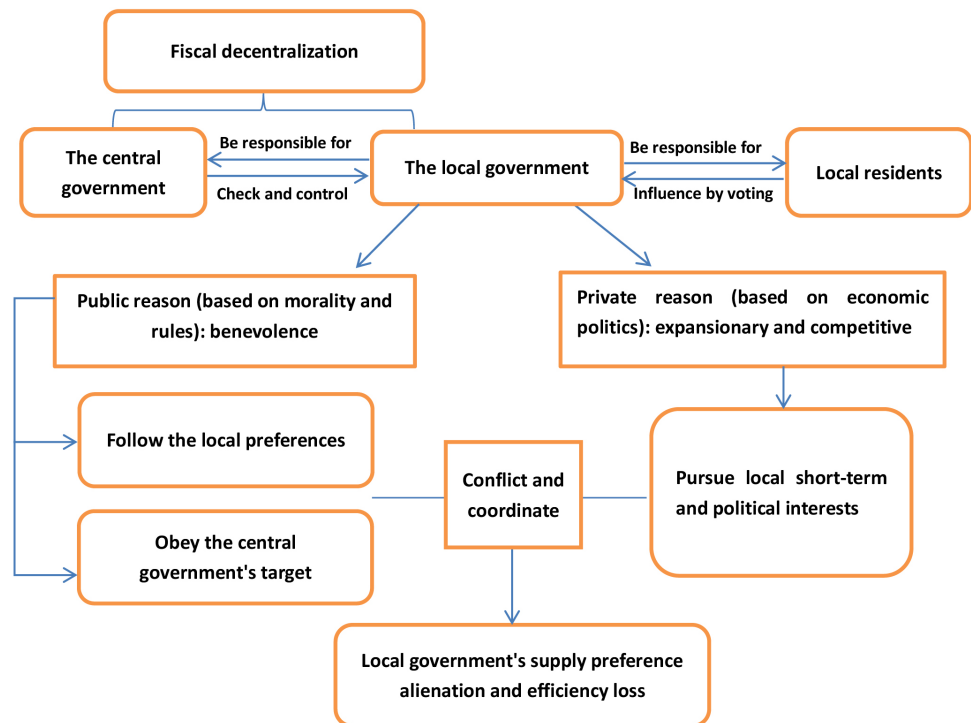


Figure 1. The action of local government under fiscal decentralization.

divisions so as to avoid the decrease in efficiency caused by unclear responsibilities. In principle, the central government's science and technology investment should go mainly into science and technology projects that are of major relevance to the development of the country, require a huge amount of capital, and have a very long research and development cycle and that are in need of cross-regional organizing and coordination. Local government investment in science and technology should give full play to its information advantages, pay attention to the current situation and needs of scientific research development in the region, and invest in local research and development institutions, universities and enterprises.

Secondly, decentralize some of the financial power to local governments step by step while strengthening fiscal supervision. It is necessary to pay attention to the matching of financial powers and responsibilities, and to give more financial resources to the local government to arrange investment. At the same time, the performance evaluation and supervision of the use of fiscal funds will be strengthened, and *ex ante* supervision will be changed into *ex post* facta inspections to avoid problems such as corruption and duplication of construction caused by the expansion of fiscal decentralization. The supervision can be strengthened by improving budget management, building public participation budgets, and improving fiscal transparency. While making its autonomy more effective, the local government has been subject to extensive and effective supervision so that power has been placed under the sun. This will not only better reflect the needs of local residents for public goods, but also allow the people and the central government to strengthen the supervision of local public expenditures so as to form a benign cycle and establish a long-term and effective fiscal decentralization system.

Finally, establish a scientific and fair assessment mechanism of government evaluation and officials' promotion. In recent years, China has increased its emphasis on scientific and technological investment and has continuously issued relevant policies. However, in this assessment mechanism, there are no evaluation indicators for the efficiency of science and technology investment, and the methods for quantifying the indicators are not perfect. It is suggested that the government should pay more attention to science and technology when assessing the performance of officials, and should concretize and decompose the development goals so as to prevent local governments from reducing the supply of public goods that have a long return time for short-term economic benefits.

6. Suggestions for Further Research

The main contribution of this paper is to analyze the effect of fiscal decentralization and local government's behavior preference on the efficiency of science and technology investment based on Chinese practice through normative analysis methods. It will enrich the research results in this field, and provide reference for further research. The main limitation of this paper is the lack of data analysis and empirical analysis to support the theoretical conclusions.

Scholars at home and abroad have abundant research results on fiscal decentralization, local government supply preference and related problems, and the theoretical framework is clear. However, the following problems still exist.

Firstly, from the research method, scholars tend to classify government science and technology investment as a class of non-economic public goods such as education, cultural, and public health. However, as the public product that can make a tremendous contribution to economic growth, science and technology investment should be classified in the category of economic public goods in nature. The research method of classifying science and technology investment into non-economic public goods may obscure the true mechanism of the effect of fiscal decentralization and government's behavior preferences on the efficiency of science and technology investment. Secondly, from the research focus, previous studies have focused more on the impact of fiscal decentralization on the total amount of government financial investment, and less research on the efficiency of government financial investment. Finally, from the research perspective, most of the research is from the perspective of government supply, which ignores the perspective of public demand.

By the way, because each country's political, economic, and cultural environment is different, scholars must consider the situation in different countries when studying this issue.

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