ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

Research on the Impact of Government Subsidies on Innovation Input and Innovation Efficiency of Strategic Emerging Industries Based on Data of 25 Listed Companies in Anhui Province

Zhuoya Ye[1, a, *], Zejiong Zhou[2] and Zhaoyi Du[2]

[1]School of Finance, Anhui University of Finance and Economics, China;

[2]School of Economics, Anhui University of Finance and Economics, China.

[a]Corresponding author e-mail: 416968072@qq.com

Abstract

Innovation and R&D cycle of strategic emerging industries is long and its investment risk is high. Enterprises' enthusiasm to invest their own funds in innovation activities is not high. In order to encourage strategic emerging industries to carry out innovative activities, the government has given a large amount of R&D funding support. Taking Anhui strategic emerging industries as an example, this paper empirically studies the impact of government subsidies on enterprise innovation from two aspects of innovation input and innovation efficiency. Firstly, the panel data model is used to study the impact of government subsidies on R&D investment. The results show that government subsidies have a positive impact on R&D investment of enterprises. Secondly, the DEA method is used to measure the innovation efficiency of enterprises, and the panel data model is used to study the impact of government subsidies on the innovation efficiency of enterprises. The results show that the innovation efficiency of sample firms is generally not high and there are large differences among different firms. Government subsidies can improve the innovation performance of firms. Finally, it puts forward countermeasures and suggestions on how to improve the way of government subsidies and the efficiency of enterprise innovation.

Keywords

Strategic emerging industries; government subsidies; innovation input; innovation efficiency.

1. INTRODUCTION

After the world financial crisis in 2008, the world economic pattern has changed dramatically. Governments of all countries have taken different measures to promote their own economic development and consolidate their status in the world economic development pattern, one of which is to develop strategic emerging industries. The U.S. government focuses on the new energy industry, especially the new energy equipment manufacturing industry. In the process of developing new energy, the U.S. government mainly improves the innovation ability and output of related industries through government subsidies, and actively adopts the way of public-private partnership, effectively absorbs private investment, and improves the efficiency of the fund. Japan vigorously develops the electronic information industry, making it the pillar industry of Japan's economy. Japan makes good use of its industrial policies, focusing on long-term demand, and emphasizes the use of structural adjustment to constantly improve the industrial structure to promote development, rather than directly supporting industries and expanding government support [1].

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

For a long time, China's economic development depends heavily on natural resources. With the continuous development of China's economy, the dilemma of resource constraints has become increasingly prominent. Therefore, in 2010, the State Council proposed to continuously promote industrial upgrading, cultivate strategic emerging industries into the pillar industries of China's economic development, and constantly improve the core competitiveness of the industry [2]. Since then, relevant policies have been issued all over the country to invest in the development of strategic emerging industries. As one of the major provinces of science and technology in the central region, Anhui Province actively responded to the call of national development strategy and took the lead in promoting the agglomeration development of strategic emerging industries by compiling regulations in July 2017. In the face of complex and severe external environment as well as many real economic difficulties and great downward pressure, the government urgently needs to strengthen the overall planning, take effective support policies, maintain the rapid growth of strategic emerging industries, and constantly improve the ability of independent innovation, so as to make it become the initiative of economic and social development. Based on the increasingly important background of strategic emerging industries, this paper discusses the impact of government subsidies on enterprise innovation. Taking the strategic emerging industry of Anhui Province as an example, this paper selects the data of 25 listed companies in this industry to study the impact of government subsidies on innovation investment and innovation efficiency of sample companies, so as to provide a theoretical basis for the future government to support the development of enterprises.

2. IMPACT OF GOVERNMENT SUBSIDIES ON R&D INVESTMENT OF ENTERPRISES

From the seven strategic emerging industries identified in Anhui Province, 25 companies listed for more than three years were selected, and their data in the past three years were selected to use the panel data model to study the impact of government subsidies on R&D investment.

2.1. Data Selection and Descriptive Statistics

Due to the small number of listed companies and scattered industries in Anhui Province, 25 representative listed companies of strategic emerging industries are selected as sample enterprises according to the classification catalog of strategic emerging industries for the use of the research needs and data availability. Considering the existence of newly established enterprises and the fact that some long established enterprises have been transformed into strategic emerging industries through industrial upgrading in recent years, the panel data of 2015-2017 is selected to study the impact of government subsidies on the use of corporate R&D funds. The 25 companies studied in this paper are scattered in various strategic emerging industries and may be affected by different industrial factors. At the same time, the development situation of these companies is different. Some of them are newly established enterprises, some of them have a long establishment time, and others are transformed into strategic emerging industries through transformation and upgrading.

In the empirical analysis, R&D investment is used as an indicator to measure the use of R&D funds. The data comes from the R&D expense items in the operating cost items in the profit statement in the annual report of the enterprise. The core explanatory variable in the econometric model is government subsidy, which measures the intensity of government subsidy based on the subsidy related to enterprise innovation in the government subsidy under the non operating income in the annual report of the enterprise; the other explanatory variables are the enterprise size composed of the enterprise assets and the number of personnel. The descriptive statistical results of R&D expenditure, government subsidies, total assets and total employees are shown in Table 1:

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

Table 1. Descriptive statistics of variables in the impact model of government subsidies on R&D investment of enterprises in 2015-2017

Variable name	Mean value	Median	Maximum value	Minimum value
R&D investment (10000 yuan)	12932.81	6327.30	114532.90	886. 67
Government subsidy (10000 yuan)	3737.44	1994.62	21609.37	75.12
Total assets (10000 yuan)	507046.12	461228.92	1624800.60	92067.42
Total number of employees	3221.37	2354	19010	712

From table 1, it can be seen that the average value of R&D investment of sample enterprises in 2015-2017 is 129,328,100 yuan, the maximum value is 129.17 times of the minimum value; the average value of government subsidies is 373,744 yuan, the maximum value is 287.67 times of the minimum value; the total asset value of enterprises has a striking gap, the maximum value is 17.65 times of the minimum value; the average value of total employees is 3221.37 people, the maximum value is 26.70 times of the minimum value. It can be seen that the development gap among listed companies in strategic emerging industries in Anhui Province is too wide. The larger the company scale is, the higher the amount of government subsidies it receives.

2.2. Establishment of Panel Data Model

Panel data is a kind of hybrid data of section data and time series data. At a fixed time point, panel data is the section observation value of multiple individuals; for a fixed individual, panel data is a time series [3]. Before establishing panel data model, we usually use Hausman test to determine whether the model is fixed effect model, random effect model or mixed effect model [4]. According to the results of Hausman test, this paper selects the random effect model to regression analysis the panel data. The panel data model is as follows:

$$\ln Y_{it} = \beta_{0t} + \beta_{1t} \ln X_{1it} + \beta_{2t} \ln X_{2it} + \beta_{3t} \ln X_{3it} + \varepsilon_{it} \quad (1)$$

Among them, Y_{it} is the R&D investment of the enterprise, X_{1it} is the government subsidy, X_{2it} is the total asset value, X_{3it} is the total number of employees, β_{0t}, β_{1t}, β_{2t} and β_{3t} are coefficient items, and ε_{it} is the random interference item.

2.3. Empirical Results and Analysis

Regression analysis is carried out by using STATA measurement software model (1), and the results are shown in Table 2:

Table 2. Model regression results

Variable	Coefficient	Probability
lnX1it	0.016	0.068
lnX2it	0.843	0.000
lnX3it	0.135	0.364
Con	-2.077	0.448
R2=0.547		

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

It can be seen from table 2 that the government subsidy has a positive impact on the R&D investment of enterprises. For every 1% increase in the government subsidy, the R&D investment of enterprises increases by 0.016%, indicating that the government subsidy has a certain incentive effect on the innovation activities of enterprises. For every 1% increase in the total assets of the enterprise, the R&D investment of the enterprise increases by 0.843%, indicating that the R&D investment of the enterprise increases with the expansion of the enterprise scale. Compared with the scale of enterprises, the incentive effect of government subsidies on R&D investment is weak, which is related to the transmission process of government subsidies. Government subsidies provide financial support to strategic emerging enterprises, hoping that these enterprises can use the funds for their innovation activities. However, most of the sample enterprises in Anhui Province are in the initial stage, or they have just transformed from traditional enterprises to strategic emerging enterprises, so they are more cautious about the use of innovation funds. Although there is a positive correlation between the number of employees and the R&D investment, it does not pass the significance test, which indicates that the increase of employees may not necessarily promote the increase of R&D investment. The number of employees in an enterprise is one of the indicators reflecting the size of the enterprise. For those enterprises with a large number of employees, the size of the enterprise is relatively large, and they pay more attention to the innovation investment of the enterprise. However, for those enterprises with a large proportion of low skilled employees, even if the number of employees is large, the innovation investment has not been increased.

3. THE IMPACT OF GOVERNMENT SUBSIDIES ON INNOVATION EFFICIENCY OF ENTERPRISES

Although the government subsidy can increase the innovation input of enterprises, it does not necessarily lead to the improvement of the innovation efficiency of enterprises. Therefore, this part will first use DEA method to calculate the innovation efficiency of enterprises, and then use panel data model to study the impact of government subsidies on the innovation efficiency of enterprises.

3.1. Measurement of Innovation Efficiency of Enterprises

Innovation efficiency measures the ability of enterprises to transform innovation input into innovation output. DEA data envelopment model, SFA stochastic frontier model and GMM system analysis are commonly used empirical methods. In the empirical model of this paper, it is difficult to determine the operation mode of enterprise innovation, that is, enterprise innovation does not follow a certain fixed equation, and there is a certain random deviation in the sample data [5]. Therefore, DEA method is used to evaluate the innovation efficiency of sample enterprises.

3.1.1 Index selection

For DEA efficiency model, the selection of input-output variables determines the model form of efficiency measurement. Referring to the relevant literature of enterprise innovation efficiency evaluation, the annual R&D investment and the number of R&D personnel are selected as two input indexes of DEA efficiency evaluation model. The innovation output index generally uses the number of patents newly added by enterprises every year. However, in view of the fact that most strategic emerging enterprises in Anhui Province are emerging enterprises, and the number of patents per year is small and unstable, the increase of patents, patent software and technology in intangible assets of enterprises each year is selected as the innovation output index [6]. The description of indexes selected in DEA efficiency evaluation model is shown in Table 3:

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

Table 3. Input and output variables in DEA efficiency evaluation model

variable	Variable name	Variable description
Y1	Intangible assets	The increase of patent right, patent software and technology in intangible assets of the enterprise every year.
X1	Enterprise R&D investment	The total amount of R&D investment of the enterprise every year.
X2	Enterprise R&D personnel	The number of R&D personnel of the enterprise every year.

3.1.2 Descriptive statistics

The sample selected in this part is consistent with the above. The data of 2015-2017 are selected to evaluate their innovation efficiency. The variables selected in the efficiency evaluation model are intangible assets (increase of patent right, patent software and Technology), R&D input and R&D personnel. The descriptive statistics of these three input-output variables are shown in Table 4:

Table 4. Descriptive statistics of variables in DEA efficiency evaluation model

Value	Mean value	Median	Maximum value	Minimum value
Intangible assets (10000 yuan)	5265.40	780.99	1.08	73655.29
R&D investment (10000 yuan)	12932.81	6327.30	886.67	114532.90
Number of R&D personnel	582.17	349	79	5739

It can be seen from table 4 that there are significant differences in the scale of 25 listed companies in Anhui Province. The difference in the added value of intangible assets of enterprises is more obvious, with the maximum value of 736,552,900 yuan and the minimum value of 10,800 yuan; the maximum value of R&D investment is 114,532,900 yuan and the minimum value of 8,866,700 yuan; the maximum number of R&D personnel is 5,739 and the minimum value is 79. The absolute values of R&D input and R&D output of the company have a wide gap, and the standard deviation is also very large. In evaluating the innovation efficiency of enterprises, we can compare the innovation efficiency of different companies by the model of variable scale, because the enterprise efficiency calculated by the model of variable scale will not be affected by the size of enterprises.

3.1.3 Model selection

According to the different orientation of input-output model, DEA model is divided into input oriented DEA model and output oriented DEA model. Among them, the input-oriented DEA model is to determine the optimal input factor ratio to maximize efficiency while keeping the output unchanged; while the output-oriented DEA model is to determine the optimal output to maximize efficiency while keeping the input factor ratio unchanged [7]. CRS model is an input oriented model proposed by Charnes, Cooper and Rhodes (1978), which assumes that the return on scale is constant. When all enterprises operate at the optimal scale, the CRS model assuming constant return on scale is reasonable, but it is difficult for enterprises to operate at the optimal scale due to insufficient market competition. For strategic emerging industries, the market environment faced by enterprises is unstable, while government policies are constantly

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

changing with the development of the industry. The operation of enterprises needs to constantly adjust these uncertain factors, so enterprises may not be able to operate at the best scale. Banker, Charnes and Cooper (1984) proposed to adjust CRS model with constant return on scale to VRS model with variable return on scale, so as to solve the problem of change in return on scale [8]. Therefore, this paper chooses VRS model, which is oriented to variable returns to scale, to measure the innovation efficiency of 25 strategic emerging enterprises in Anhui Province.

Table 5. Innovation efficiency of strategic emerging industries in Anhui Province, 2015-2017

Company abbreviation	Comprehensive technical efficiency	Pure technical efficiency	Scale efficiency
FENGYUAN PHARMACEUTICAL	0.744	0.987	0.747
COFCO BIOCHEMICAL	0.206	0.717	0.271
ECEC	0.044	0.508	0.085
TRUCHUM	0.045	0.210	0.234
iFLYTEK	0.136	0.676	0.408
WANTONG TECHNOLOGY	0.216	0.362	0.432
SHENJIAN NEW MATERIALS	0.089	0.621	0.147
SANQI INTERACTIVE ENTERTAINMENT NETWORK TECHNOLOGY	0.006	0.099	0.060
MEIYA OPTOELECTRONIC TECHNOLOGY	0.002	0.313	0.006
FENGXING WEAR RESISTANT MATERRIALS	0.014	1.000	0.014
TOKEN SCIENCES	0.145	0.302	0.362
ANKE BIOTECHNOLOGY	0.218	0.487	0.337
SHENGYUN ENVIRONMENT PROTECHTION TECHNOLOGY	0.377	0.577	0.568
ANLI MATERIAL TECHNOLOGY	0.002	0.311	0.005
SUNGROW POWER SUPPLY	0.005	0.162	0.030
GUOZHEN ENVIRONMENT PROTECHTION TECHNOLOGY	0.669	1.000	0.669
JIANGNAN CHEMICAL INDUSTRY	0.006	0.363	0.017
LEKING WELLNESS	0.167	0.588	0.241
WANWEI UPDATED TECHNOLOGY	0.003	0.184	0.017
JINGGONG STEEL BUILDING	0.001	0.155	0.008
TRIUMPH SCIENCE&TECHNOLOGY	0.099	0.292	0.380
JINGDA SPECIAL MAGNET WIRE	0.002	0.364	0.005
TONGFENG ELECTRONICS	0.046	0.683	0.057
SUN CREATE ELECTRONICS	0.060	0.151	0.393
METALFORMING INTELLIGENT MANUFACTURING	0.017	0.647	0.027
Mean average	0.133	0.470	0.221

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

3.1.4 Empirical results and analysis

Based on the relevant data of listed companies, we use DEAP software to calculate the average comprehensive technical efficiency, pure technical efficiency and scale efficiency of 25 listed companies in strategic emerging industries in Anhui Province, as shown in Table 5:

It can be seen from table 5 that the average comprehensive technical efficiency of strategic emerging industries in Anhui Province in recent three years is generally not high, and the differences between different enterprises are also large, which is closely related to the development imbalance between enterprises. According to the results of the sub enterprises, only FENGYUAN PHARMACEUTICAL Industry and GUOZHEN ENVIRONMENT PROTECHTION TECHNOLOGY have higher comprehensive technical efficiency, both of which are relatively mature enterprises with earlier listing time and relatively stable scale. However, the comprehensive technical efficiency of other companies is below 0.4. Obviously, compared with the more mature enterprises, the comprehensive technical efficiency of the companies that have just started transformation and listing is low. The reason is that the strategic emerging industries in Anhui Province were put forward and the supporting policies were launched late. In recent years, they have just risen. Among the 25 selected samples of listed companies, some enterprises have realized the transformation from traditional manufacturing enterprises to emerging manufacturing enterprises according to national policies and social needs in the near future.

In terms of pure technical efficiency, the pure technical efficiency of six enterprises, such as TRUCHUM, SANQI INTERACTIVE ENTERTAINMENT NETWORK TECHNOLOGY and SUN CREATE ELECTRONICS, is less than 0.3. Compared with the developed enterprises, the pure technical efficiency of these six newly established or transformed new enterprises is relatively low, and the innovation management ability and efficiency of enterprises are not high, but most of them have relatively high scale efficiency, which shows that they have quite high development potential, and can significantly improve the innovation efficiency of enterprises by expanding the innovation scale of enterprises. The pure technical efficiency of eight enterprises, such as FENGYUAN PHARMACEUTICAL, ECEC and iFLYTEK, is more than 0.5, which indicates that the innovation ability of these eight enterprises tends to be mature, and the innovation technology and innovation management ability are higher than other enterprises. The scale efficiency of WANTONG TECHNOLOGY and TRIUMPH SCIENCE&TECHNOLOGY exceeds its pure technology efficiency, which shows that the innovation efficiency of the two companies mainly comes from the expansion of their innovation scale. The scale efficiency of SHENGYUN ENVIRONMENT PROTECHTION TECHNOLOGY is not much different from its pure technical efficiency, and both of them are more than 0.5, indicating that the innovation potential of the two companies is large.

From the perspective of scale efficiency, in addition to FENGYUAN PHARMACEUTICAL, iFLYTEK and GUOZHEN ENVIRONMENT PROTECHTION TECHNOLOGY, which are large-scale and relatively mature or in the state of constant and decreasing scale returns, while other enterprises are in the stage of increasing scale returns. The results show that the scale reward of innovation activities of most sample enterprises will increase with the expansion of enterprise scale. From the perspective of enterprise life cycle theory, these enterprises are in the development period of enterprises and have considerable development space.

3.2. Panel Data Analysis of the Impact of Government Subsidies on Innovation Efficiency of Enterprises

This paper uses the value of innovation efficiency calculated by DEA model as an index to measure the innovation efficiency of enterprises, and uses panel data model to study the impact of government subsidies on the innovation efficiency of enterprises.

3.2.1 Establishment of panel data model

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

Due to the large scale difference among different enterprises, the explained variable enterprise innovation efficiency value is between 0 and 1. Therefore, selecting logarithmic model in panel data model regression makes the data smooth and the conclusion easier to interpret. Therefore, in the regression model of panel data in this part, it is assumed that the model form is:

$$Z_{it} = \beta_{0t} + \beta_{1t} \ln X_{1it} + \beta_{2t} \ln X_{2it} + \beta_{3t} \ln X_{3it} + \beta_{4t} \ln X_{4it} + \varepsilon_{it} \quad (2)$$

Among them, Z_{it} is the value of enterprise innovation efficiency, X_{1it} is the value of Government R&D subsidy, X_{2it} is the total value of assets, X_{3it} is the total value of fixed assets, X_{4it} is the total number of employees, β_{0t}, β_{1t}, β_{2t}, β_{3t} and β_{4t} are coefficient items, and ε_{it} is random interference item.

3.2.2 Empirical results and analysis

According to the results of Hausman test, this paper uses the panel data model of random effects to empirically study the impact of Government R&D subsidies on innovation efficiency of enterprises. Regression analysis was carried out with STATA software model (2), and the results are shown in Table 6:

Table 6. Regression results of panel data model

Variable	Coefficient	Probability
lnX1it	0.017	0.050
lnX2it	-0.104	0.017
lnX3it	0.061	0.353
lnX4it	-0.224	0.011
Con	-3.023	0.059
R2=0.282		

It can be seen from table 6 that for every 1% increase in government subsidies, the innovation efficiency of enterprises will increase by 0.017%, indicating that government subsidies can improve the innovation performance of enterprises. It can be seen from the above that the innovation efficiency of an enterprise is calculated by the DEA efficiency evaluation model from the internal R&D investment funds, R&D personnel and R&D achievements, which represents the ability of an enterprise to transform innovation input into innovation output. The increase of government subsidies improves the innovation efficiency of enterprises, which shows that the increase of innovation investment brought by government subsidies is effectively transformed into the innovation efficiency of enterprises.

From the perspective of control variables, there is a negative correlation between enterprise innovation efficiency and enterprise assets. For every 1% expansion of enterprise assets, enterprise innovation efficiency decreases by 0.104%, which indicates that the expansion of enterprise assets reduces enterprise innovation efficiency. Compared with the results of model (1), the expansion of total assets can increase the R&D investment, but it can not effectively improve the efficiency of innovation. This shows that the increase of R&D investment brought by the expansion of total assets does not improve the efficiency of innovation, and there may be room for improvement in the internal management mechanism and resource allocation. The expansion of the scale of fixed assets can improve the innovation efficiency of enterprises. For

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

every 1% increase in the scale of fixed assets, the innovation efficiency of enterprises will increase by 0.061%, which shows that the infrastructure construction and equipment investment of enterprises can improve the innovation efficiency of enterprises to a certain extent. For innovative enterprises, every part of the purchased fixed assets is used to update the production line and carry out innovative R&D activities. These hardware facilities can help enterprises engage in technological R&D and innovation activities to improve the efficiency of innovation. For every 1% increase in the number of employees, the innovation efficiency of enterprises will be reduced by 0.224%. The reason is that the overall quality and professional skills of the employees in the sample enterprises are not high. For enterprises with large scale of employees, the innovation efficiency of enterprises is relatively low due to the large number of low skilled employees and the imperfect employee management system.

4. PROBLEMS AND SUGGESTIONS

Through empirical research, we can see that enterprise innovation is closely related to government subsidies. Government subsidies can promote enterprises to expand R&D investment, but also effectively improve the efficiency of enterprise innovation. However, there are still some problems in the impact of government subsidies on the innovation activities of enterprises: the innovation efficiency of large-scale enterprises is high, but the innovation efficiency of small and medium-sized enterprises is generally low; in order to obtain government subsidies, there is the possibility of rent-seeking; the way of government support for enterprise innovation is still simplified, mainly government funds subsidies; the marketization process of enterprise innovation results is slow, and the effect of government subsidies on the final output of innovation is not obvious.

In view of the existing problems, the following policy recommendations are put forward: expand R&D investment from governments at all levels and provide precise support; make rational use of Government R&D funds and strengthen fund supervision; choose Government R&D investment methods flexibly and broaden the financing channels of enterprises; rely on the market to reasonably transform innovation results.

5. CONCLUSION

Taking Anhui strategic emerging industries as an example, this paper empirically studies the impact of government subsidies on enterprise innovation from two aspects of innovation investment and innovation efficiency, and draws the following conclusions:

Firstly, using panel data model we study the impact of government subsidies on enterprise R&D capital investment. The results show that the government subsidies have a positive impact on the R&D investment of enterprises. For every 1% increase in government subsidies, the R&D investment of enterprises increases by 0.016%, indicating that the government subsidies have a certain incentive effect on the innovation activities of enterprises.

Secondly, using DEA model, we calculate the value of enterprise innovation efficiency and use it as an indicator to measure the innovation efficiency of enterprises. Using panel data model, we study the impact of government subsidies on enterprise innovation efficiency. The results show that for every 1% increase in government subsidies, the innovation efficiency of enterprises will increase by 0.017%, which shows that government subsidies can improve the innovation performance of enterprises.

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202004_6(4).0036

REFERENCES

[1] Jian Yu. Strategic emerging industry development path selection and financial policy response under the new normal based on the perspective of demand end. Financial research, (2015)No.6,p.70-75.

[2] Huanfang Wang, Jianshe Chen, Hou Bin. Research on strategies to promote the development of strategic emerging industry clusters. Economic survey, (2015)No.6,p.27-30.

[3] Qing Zhang. Spatial spillover effect of strategic emerging industry agglomeration on regional economic competitiveness based on Spatial Panel Model of Anhui Province. East China economic management, (2016)No.12,p.30-34.

[4] Xiangju Li, Huan Yang. Industrial heterogeneity, tax incentives and independent innovation: An Empirical Study of A-share listed companies in China's strategic emerging industries. Science and technology progress and countermeasures, (2019)No.1,p. 60-68.

[5] Xiaomei Li. Research on the input-output efficiency of Chinese strategic emerging industry enterprises in the US trade strike list based on the sample data analysis of 26 listed companies in 2008-2017. China Science and Technology Forum, (2018)No.11,p.178-188.

[6] Hongling Chen. Research on technological innovation efficiency of China's strategic emerging industries under environmental constraints. Economic longitude and latitude, (2018)No.3,p. 90-95.

[7] Junzhou Yan, Yi Yang. Research on supply side innovation efficiency of strategic emerging industries in China. Scientific research management, (2019)No.4,p.34-43.

[8] Qianlong Zhu, Jingdong Luan, Jialiang He. Economic benefit analysis of land use in Bengbu City, Anhui Province Based on DEA model. Journal of Shenyang University (Social Science Edition), (2018)No.4,p.397-401.