Empirical Research on Policy Evaluation of Innovation of Science and Technology in Shanghai

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Abstract. The paper collects and retrieves policies of innovation of science and technology from 1980 to 2015 the central government and the Shanghai local policies. It takes content analysis as research perspective, quantified the subject of evaluation policy, the policy topic and the policy function and other related contents, analyses and restricts legal obstacles and realistic problems of Shanghai’s technological innovation. In order to improve the existing law system of science and technology, it should further improve the legislative system of science and technology according to the requirements of science and technology development of Shanghai Municipal to legislate, timely implement works of wasting law, reforming law and establishing law of scientific and technological legislation. It focuses on key areas and weak links of scientific and technological legislation, vigorously promote implement ability of scientific and technological innovation policy, improve legal responsibility and enhance the rigidity of system.

Introduction

Scientific and technological activities of decision-making, planning, deployment, implementation, acceptance and a series of management areas to achieve sustainable long-term development is inseparable from the legal escort. From this perspective, it has very important theoretical value and practical significance to organize process of formulation and evolutionary, analyses synergies between policies, focus on the subject of policy development and the respect of policy object, refines the annual distribution of policy topic. In this regard, it is necessary to systematically organize and collect important innovation of legal policy which has been issued by country and Shanghai, quantize analysis research

The Research Framework

Analysis of Ideas

On the basis of our preliminary studies, we select the relevant policies of scientific and technological innovation, build a "hierarchy - content - tool" policy analysis framework. On this foundation, reading critical information of policy and drawing policy text encoding table is to expand the systematic and in-depth research for historical evolution of the policy, the policy level and main body and policy tools.

The Data Acquisition

We mainly through the following two ways to collect policy text: (1) The Central People's Government the portal site; Peking University of Legal Information Network. Through these two platforms, we retrieved 294 documents belong to "technology" policy group from 1980 to 2015. To ensure the integrity and relevance of retrieval, the paper sorts out policy text by the following principles: ① closely associated with scientific and technological innovation in Shanghai; ② policy
form is the law, administrative regulations, departmental rules, regulatory Documents, judicial interpretation, local regulations and local government regulations, not including scientific and technological innovation policy document of district, county, hierarchy in Shanghai. By the above method to clarify the policy text, ultimately it selects policy research sample of Shanghai’s scientific and technological innovation totaled 217, encodes to this 217 policy text.

The Research Process

The Analysis of Time Dimension

From the perspective of time series, we can basically summarize as three times to the publishing of scientific and technological innovation policy documents. ① From 1980 to 1991 was the initial development period. This period published scientific and technological polity documents is 68, accounting for 31.33% of the total. The annual number of documents published showed a greater degree of growth, national innovation policy in the period has also been fully developed. ② From 1991 to 1995 is the volatility fell period. This period published scientific and technological polity documents is 36, accounting for 16.59% of the total. Social development and scientific and technological work has entered a new stage. ③ From 1996 to 2015 is fluctuation development period. This period published scientific and technological polity documents is 129, accounting for 59.45% of the total. It has a larger amount of the policy release, and showed a more significant shockwave.

The Analysis of Industry Category

According to statistics, the industry category of scientific and technological policy documents is distributed as follows: the specific categories of scientific and technological integrated provision are 35, scientific and technological appraisal and reward are 32, technological import and export and international cooperation are 23, technological innovation and technological progress are 22, scientific research and scientific and technological project are 22, scientific and technical personnel are 17, scientific and technological achievements transformation are 11, scientific and technological information archives secrecy are 9, research funding are 9, technological Market are 8, technology contracts and arbitration are 7, scientific and technological system reform are 7, research institutes and supplies equipment are 5, scientific and technological development are 3, technology market management are 3, science and technology exchange are 2, scientific and technological statistics and taxation are 2. But it also has many weak links in the Shanghai scientific and technological legislation, ① the legislative of scientific and technological policy and resource allocation is weak, legislation needs to be further strengthen about the technical innovation, technology assessment, innovation and resource allocation. ② It urgently need to improve the innovative legislation of green and sustainable development. Establishment and implementation of the system of sustainable development, mainly related to the basic system of various types of material resources and environmental protection. ③ Legislative is not sufficient in the construction of research and development capabilities and the development of human resource.

The Analysis of Level Dimension

According to statistics, the file-level of scientific and technological policies is distributed as follows: it has 99 departmental regulations, 65 normative documents, 25 local government regulations, 15 administrative regulations, 7 laws, 5 local laws and regulations and 1 judicial interpretation. From this we can know that the connotation and extension is more broad in scientific and technological innovation policy, the legal departments it involved are more diverse, such as "Science and Technology Progress Law", "Science and Technology Popularization Law," "Promote Scientific and Technological achievements into law" and "SME Promotion Law" belong Economic Law Department, "Patent Law", "Patent Law Implementing Rules" and "Trademark Law" belong to the Civil Law Department. Content is more complex, it has poor systematic construction.
The Analysis of Policy Hierarchy

Overall, from 1980 to 2015, the introduction of technology-related legislation and policy is in a total of 217, wherein the root policy 31 (14.3%), trunk policy 26 (12.0%), branch policy 160 (73.7%). Although in recent years, a lot of Scientific and technological policy introduced, it has more appropriate proportion of root, trunk and branch, but it can be found to these branches of Scientific and technological policy research, which in some places still lack of specificity, the relevant provisions are too principle, operability is not strong. For example, "on the issuance of notice China's information industry" has a key technologies with independent intellectual property rights and important product catalog points out that it will give key support for the inclusion of directory technology and product development and industrialization, but "what aspects should be support", "how to support" do not make provisions and it is difficult to implement. Meanwhile, the "root→trunk→branch" of Scientific and technological policy system appeared with varying degrees of deviation from the Scientific and technological policy in the process of gradual refinement, in the process of implementation to some extent exist Policy space transmission phenomenon of the thunder roars loudly, but little rain falls, or below is dark clouds and no rain.

The Analysis of Keywords

Keywords are often the starting point for the core of the legislative policy of science and technology, the analysis of literature keywords can fully grasp the content and structure of scientific and technological policy. At the same time, it can also infer research focus and direction of Scientific and technological in specific areas of legislation, give researchers a reference in terms of academic topics, better focus on cutting-edge research topics. In this paper, the retrieved effective bibliographic information has a data cleansing, received a total of 187 keywords, appeared a total of 878 times, average 4.7 keywords of each. On the basis of constructing a high-frequency keyword matrix, let the matrix keyword introduce into social network analysis software Ucinet to generate keyword co-occurrence of visual graphics. Central location is intellectual property, scientific and technological talent, technological development, technological transfer, technological contracts, technological introduction, scientific and technological advancement and so on, this is research topics of concern in the legislative field of science and technology. And in a more edges keywords, such as technology companies, venture capital, fund management, networking, property system the scientific quality, technical equipment, research funds, etc., although it is not high degree of concern, but it can in some ways reflects the diversified research and development trend in the field of legislation of science and technology.

![Figure 1. On Social Network Analysis of Scientific and Technological Innovation Policy Keywords.](image-url)
The Analysis of Policy Tools

By policy tools acting as distinguish objects, policy tools can generally be broken down into the supply side tools, demand level tools, and environmental dimensions of tools. ① The supply side tools refer to the government through the support personnel, information, technology, and capital to directly expand the supply of technology, improve supply-related elements of technological innovation, guide policy points, and promote technological innovation activities. According to statistics, 60 capital inputs (accounting for 20.4%) > 17 Talent Cultivation (accounting for 5.8%) > 12 infrastructure construction (accounting for 4.1%), a total of 89, accounting for 30.3%. We can see that despite policymakers take into account in capital investment, personnel training, infrastructure construction, but it is not too balanced, capital input is much higher than the proportion of personnel training and infrastructure construction. ② The demand level tools. Demand-side policy tools refer to government purchasing of independent innovation products and trade controls and other measures by priority to reduce uncertainty in the process of technological innovation, stabilize new technologies and new markets to ensure that science and technology achievements industrialization is smooth. Combination of topic research, demand level tools can be broken down into the following two aspects, namely 3 government purchase > 2 overseas institutional management, a total of 5, accounting for 1.7%. Lack of need-based level tool, certainly in largely restricted to SMEs and research institutions into strength, lower output efficiency of research and development institutions, increase R & D costs. ③ Environmental type level tool refers to environmental factors influencing by technology development of government through the implementation of finance, the tax system, regulatory controls and other policies. It provides an enabling policy environment for technology innovation science and technology activities thus indirectly influences and promotes science and technology innovation. According to statistics, the distribution of Shanghai Scientific and technological innovation for Environmental dimension tools as follows: 71 information guide > 56 regulatory control > 23 financial support > 17 intellectual property > 16 technology intermediary > 14 preferential tax > 3 science education, a total of 200, accounting for 68%.

Policy Recommendations

Improve Scientific and Technological Legislation System

① It clearly carries out the scientific and technological legislation in accordance with national Upper scientific and technological Law. In the NPC existing legal framework for science and technology, Shanghai legislates accordance with the authority of local legislation "legislative Law", under the specific circumstances of Shanghai. Meanwhile, in the legislative process, it should pay attention to local science and technology rules and regulations that should match with current national science and technology laws and administrative regulations. ② Establishment of legislative mechanisms for cross-sectoral collaboration. It will effectively curb the trend of interests of sectors in legislation, reduce the cost of legislation, to avoid blank legislative, repeat legislative phenomenon. ③ Strengthen subsidiary legislation of science and technology. It should handle the relationship between Shanghai science and technology laws and regulations and other relevant legislation. On the one hand, the Shanghai Traditional legislative areas need to use science and technology law to solve the problems caused by the impact of modern technology; On the other hand, matching and improving the legislative system of science and technology requires adjust other aspects of comprehensive legislation.

Legislate According to Shanghai Local Technological Development

① Amendments need to dovetail the legislative plan. Starting from Shanghai’s social and economic infrastructure, the natural state of the environment, innovation-driven restructuring and development of the practical needs matches with Shanghai long-term science and technology development plan.
(2006-2020) and the local legislative plan of science and technology, makes the legislative more targeted and operability. ② Strengthen the construction of public service platform. It will be holistic planning to scientific and technological development of the whole city, ensure the smooth implementation of the strategy about "scientific and technological Shanghai", "world city", "Global Technology Innovation Center". ③ Promote green development and sustainable development. It is the inevitable choice to implement the scientific concept of development, build a conservation-oriented society, achieve sustainable development.

**Timely Implement Works of Wasting Law, Reforming Law and Establishing Law of Scientific and Technological Legislation**

① It is timely revision of legislation according to the Shanghai science and technology development and the legislative experience. Shanghai should start from the law of development of market economy and technological development law. ② Let mature science and technology policy converted into scientific and technological legislative. It is not only for innovative legislation in some areas, but also at the right time should make mature experience that is implement good effect policy documents determine and cure down in the form of law, clean up, modify, repeal and develop a range of specialized scientific and technical single law and various government regulations, improve special field laws and regulations and policies, form a complete legislative system of science and technology. ③ Reference to other provinces and cities legislative practice of science and technology. Local scientific and technological legislative work carried out relatively late, for various provinces and cities local legislative work is in the exploration process to constantly revised and mature.

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