

Research on the Influence Mechanism of Government Procurement on Enterprise Technology Innovation

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Abstract: *As one of the core tools for the revival of demand for innovation policy, public innovation procurement has the dual function of improving the efficiency of public services and promoting technological innovation. Public innovation procurement with public procurement transactions as the carrier to meet the needs of the public sector and promote technological innovation is sufficient in terms of theoretical basis and policy basis: it is beneficial to alleviate market failures and system failures, and is conducive to enhancing regional innovation vitality and building Leading the market is conducive to creative improvement of public service efficiency; public innovation procurement is essentially a coupling process between the procurement process and the innovation process. In the process of promoting enterprise technology innovation, there are three mechanisms: motivation incentive mechanism, interactive feedback mechanism and Innovation generates a proliferation mechanism, and the soundness of the above mechanism fundamentally determines the policy effect of public innovation procurement.*

Keywords: Public Procurement of Innovation (PPI); Technological innovation; Incentives

1. Introduction

Today, with the rapid development of the knowledge economy, innovation has become an important means for a country to enhance its core competitiveness. This has become a global consensus, and the effectiveness of innovation policies has been fully proved by relevant theories and practices. With the further development and improvement of the innovation system, the system's innovation policy has gradually replaced the traditional linear innovation policy into the mainstream of scholars' research.

Since the 1990s, as supply-side innovation policies have been unable to deal with many major social challenges and fierce global competition alone, more and more innovative scholars have begun to re-examine the role of demand in stimulating and shaping innovation. The trend is called "the revival of the demand side". Among them, the use of public procurement to promote innovation - Public Procurement of Innovation (PPI) is an emerging innovative policy tool. Since the 1990s, PPI has gradually become one of the important tools in the regional and national innovation policy mix of the OECD, the European Union, the United States, and Japan. The value of PPI is not only the shaping and promotion of innovation, but also the importance of improving the efficiency and performance of the public sector.

Studies have shown that public innovation procurement has positive significance for creating an innovative and friendly market, enhancing innovation power, breaking the rigid market structure and cultivating innovation culture. Moreover, in the long run, public innovation procurement is more stimulating and more intensive to innovation than policy tools such as R&D subsidies. Aschhoff&Sofka used a comparison of 1,100 German company data to analyze four innovation policies – innovation regulation, R&D subsidies, university basic research funding and public

innovation procurement – and found that public innovation procurement works best in certain regions and industries (in the face of the economy) The areas of downward pressure, as well as the distribution service industry and technical service industry, are particularly obvious.

As a policy tool, the significance of public innovation procurement is not only to shape and promote innovation, but also to enhance the efficiency and performance of the public sector. Therefore, it is necessary to systematically study and summarize the policy action mechanism of government procurement to promote scientific and technological innovation, and propose practical and feasible countermeasures and suggestions for government procurement to play a role in promoting industrial independent innovation.

2. Literature Review

Scientific and technological innovation is mainly focused on the following aspects: ① Policy performance evaluation research, Kestenbaum, Ai Bing, Tian Yishun and Sun Leichao respectively from government procurement efficiency, gray From the perspective of correlation matrix model, performance evaluation model and co-integration analysis, this paper studies the performance evaluation of government procurement to promote technological innovation. ② Research on the mechanism of action, JakobEdler, Jillian Yeow , Aschhoff , Correia , Hu Wei and Huang He respectively from the role of intermediaries in public innovation procurement and how to play a role and promote From the perspectives of SME development, low-carbon government procurement, case analysis, and policy function analysis, the role of government procurement in promoting technological innovation is studied. ③ Research on problems and suggestions, Siemiatycki,Lember, Elvira Uyerra , Song Hefa , and Guo Bao introduced market competition, local government lack of awareness, strengthened information circulation, and

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clarified product certification standards. From the perspectives of whole-process monitoring and other aspects, the existing problems and improvement suggestions of government procurement to promote technological innovation are studied.^④ Comparative research at home and abroad. This part of research is mainly carried out by domestic scholars. Chang Chao, Guo Wen, and Ai Bing have summarized their enlightenment to China based on a comparison of domestic and foreign policies.

In summary, although scholars at home and abroad have conducted research on government procurement to promote scientific and technological innovation from multiple perspectives, there is still a lack of systematic research on the role of government procurement in promoting technological innovation.

3. PPI's connotation and theoretical basis

3.1 The connotation of PPI

PPI refers to the public sector's purchase of new products, new services, or a combination of the two in order to meet its functional needs, in order to achieve improvements in the effectiveness of public services and to increase the supply of social innovation. In essence, the role of PPI in innovation is the push-pull coupling process between technology promotion and market pull. It not only provides the technology and solution foundation for innovation generation and diffusion, but also stimulates the demand for innovation. Therefore, it is a demand side. Innovation policy tool.

Compared with the conventional procurement process, PPI has higher requirements for innovation of results. In the implementation, the frequency of information exchange between the supply and demand sides, the depth of interaction, and the procurement ability of public organizations are higher. At the same time, it is not a simple innovation. Process, compared with the typical innovation process, PPI is a proactive interaction process that is demand-oriented, both the supply and demand sides participate together, and the innovation risk is shared. Therefore, the realization of PPI is the result of the coupling between the procurement process and the innovation process. Therefore, we understand from two perspectives that it is a procurement realization process from the perspective of the buyer; from the perspective of the innovation provider, it is a Innovative implementation process.

General realization process of public innovation procurement

The process of achieving public innovation procurement generally includes the following five stages:

First, identify the social issues or major challenges that a public institution needs to address;
Second, the identified challenges are translated into

functional specifications.

Third, the tendering process:

- a) Open through the tendering process.
- b) Potential suppliers translate functional specifications into technical specifications.
- c) The supplier submits a formal bid.

Fourth, evaluate the grant of tenders and contracts.

Fifth, the process of childbirth:

- a) Product development.
- b) Product production.
- c) Product delivery.

This general structure does not imply that the PPI process has linear properties, and these general steps are interrelated and intertwined.

3.2 The theoretical basis of PPI

The legitimacy and rationality of using public procurement to promote innovation involves three levels: First, public procurement is an important component of "local" demand, which is determined by the decision-making of multinational enterprises and also the innovation that tends to appear in a given A major factor in location. Second, a series of market and system failures affect the transformation of demand into innovative products that should appear in functional markets, but public procurement can effectively correct this situation. Third, buying innovative solutions offers tremendous potential for improving public infrastructure and public services.

(1) Remediating market failures and system failures

As with the rationale for taking supply-oriented measures, market failures (mainly information asymmetry) and system failures (insufficient interaction between supply and demand). The full application of public procurement may play a role in overcoming these problems.

Because of the information stickiness and transaction costs, on the one hand, potential buyers, private and public, often do not know or fully understand what products and services the market can provide for them, or what kind of innovations they can offer them. Improvement or process optimization). Vendors of potential new products and services often lack the knowledge customers may need in the future. On the other hand, suppliers often cannot grasp future solutions in a timely manner. The interaction and communication between users and producers tends to be poor, and the decentralized demand is not enough for suppliers to get signals and turn them into innovations. This is also related to the lack of trust between innovation and innovators on the private and public needs side and the lack of skills to use and utilize innovation. All of this brings risks and even uncertainty to suppliers.

Public procurement can achieve a clustering effect through a large scale of single purchases or by bundling the needs of

various public entities. This public demand creates a clear incentive for manufacturers, reduces their market risk, and enables early economies of scale and learning. This clustering effect also spawned manufacturing branches related to the corresponding innovations. This effect is particularly strong for emerging technologies, where industry can respond to the strong demands of public organizations. Compared to R&D subsidies, specific country needs for innovation not only increase technical capabilities, but also increase innovative production capacity.

Public procurement can also reduce transaction costs incurred in adapting to new products, through the use of innovation on a large scale or by demonstrating its use. The public's acceptance of innovation has further signaled to the private market; it has demonstrated relevant features that have raised early recognition.

Finally, the state, under conditions supported by purchasing power, may help to develop meaningful standards and align standards, thereby allowing companies to internalize spillovers, which in turn can increase investment in R&D.

(2) Enhance regional innovation vitality and promote leading market

As Potter shows in his groundbreaking work, National Competitive Advantage, local demand conditions (including demand size and demand maturity) have a major impact on regional innovation dynamics. The proposed leading market theory believes that there are leading users who are more willing to purchase and apply innovation, which is a key element in the innovation ecosystem needed to lead the market. Public procurement can leverage its scale and quality advantages to provide support and motivation to enhance regional innovation and drive leading markets.

Regional demand is a major source of increased geography and business competitiveness. The state of domestic demand plays a vital role in the vitality of national innovation. In addition to factor endowments, industrial structure and corporate strategy (competitive posture), complex and challenging needs are one of the four key variables in determining location attractiveness and performance. Demand conditions are also related to market size, and larger markets enable local producers to achieve economies of scale as early as possible and receive more diverse feedback from users. More importantly, the state of demand depends on the complexity of the demand, which in turn drives producers to innovate to meet new demands or regulations, or to have a friendly attitude towards innovative products.

The concept of leading users can be extended to the concept of leading the market, which requires early innovation to make up one's own market through multiple users of this type or through a single user with sufficient purchasing power (this is a public procurement can have In this case, the learning benefits are supplemented, reducing the

investment risk required for R&D and innovation. It is expected that other markets will adopt the resulting design to have an international dominance ("dominant design"). The dominant market is characterized by a consumer who is willing to pay a premium for a particular feature of innovation, or even pays a premium for its novelty itself in some consumer markets. This may imply a high degree of customer "intelligence", which means predictive knowledge of technology. A compatible infrastructure can also be a factor. In general, these markets should be large enough to keep innovation costs within acceptable limits. Market demand should also be sufficiently versatile to expand/export to a broader market as a result of continued innovation or scale of production. Finally, a dominant market should provide general conditions that are more conducive to innovation, such as effective and rapid regulatory structures, intellectual property protection, and so on.

The role of the state in creating or assisting in the creation of a dominant market is primarily to provide a means of combining the measures of both the supply and the demand. This includes providing appropriate framework conditions to guide and implement innovation activities (infrastructure, adequate R&D foundation, support cooperation, etc.). However, in addition to this, the state can support leading users and lead the adoption of innovation, so that they are expected to become the dominant design in the world market. More importantly, for our discussion of public procurement, the state can use its own as the dominant user to launch the dominant market through the scale or characteristics of public procurement.

(3) Performing public organization functions and improving service efficiency

The primary goal of public procurement is to perform organizational functions and achieve mission. But as the saying goes, "needs are not equal to demand." Whether it is regular public procurement or public innovation procurement, it is a tool to turn public needs into needs. Compared with conventional public procurement, public innovation procurement has irreplaceable value and advantages in dealing with major social challenges—global warming, energy depletion, water and food safety, public health, an aging society, and even scholars. It is believed that public innovation procurement is also an important tool to promote the modernization and leanness of public sector management.

Further reasons for requiring public procurement of cutting-edge products and services are to improve national functions and contribute to the achievement of public missions. Innovative procurement may be linked to normative policy objectives such as sustainability or energy efficiency, and this can be achieved more quickly and effectively through innovation. Political goals are based on (known) social needs. As pointed out by Mowery and Rosenberg, the need is not the same as the need to elaborate and regulate through the market. This view reinforces the discussion of public procurement as a means of market

incentives, as this may be one of the means of translating cognitive needs into specific market needs. This is why the economic argument that triggers innovation drives how to meet the government's sectoral political arguments for better performance in governance. The reason for buying expensive innovations (paying for innovation premiums) and investing in innovation early in the innovation cycle stems from this policy mission. Innovative leverage in public procurement measures and measures designed to meet social goals—enhancing private demand stem from the fact that the most common social goals on which procurement depends are transforming new needs into needs that require innovative solutions. It shows that countries tend to be more demanding than private consumers in meeting new social needs and providing infrastructure and public services. In order to fulfill its mission, the state is often a leading user in improving its functions.

4. PPI stimulates innovation mechanism analysis

4.1 Motivation Incentive Mechanism

PPI as a demand-policy tool stimulates the intrinsic motivation of enterprises by enhancing the intrinsic motivation of innovation and reducing the uncertainty of innovation, so that enterprises are willing to start from the innovation goal and carry out the functional system of innovative actions. Including cost sharing effects and signal effects.

(1) Cost sharing effect

PPI refers to the sharing of innovation costs, eliminates corporate innovation concerns, and enhances the incentives for companies to innovate. Due to the high risk of innovation and the uncertainty of technology and market, the innovation motivation of enterprises is insufficient. The PPI policy procurement R&D service is equivalent to investing funds for R&D, which actually shares the innovation cost, plus PPI for the project process. Strict management, technical uncertainty is reduced, which in turn enhances the company's motivation for innovation. In addition to reducing innovation costs and reducing technical uncertainty, PPI will also reduce market uncertainty. The PPI procurement contract includes the commercialization process, that is, the public procurement organization will provide a guiding market for innovation results, ensure that the company's innovative behavior can obtain certain economic profits, accelerate the recovery cycle of innovation costs, reduce market uncertainty, and then strengthen the enterprise. The motivation for innovation stimulates the development of corporate innovation behavior. Therefore, companies can seize this policy advantage and use capital and environmental advantages to carry out innovative actions.

(2) Signal effect

The government acts as a third-party entity to intervene in the interaction between the company and the external

investors by purchasing the identity of Party A. Its role is as follows: ①Obtaining orders for government procurement often requires scientific and rigorous project screening and demonstration procedures. A comprehensive survey and evaluation of the level of innovation capability and the technical elements, development prospects, and economic contribution of the application for subsidy projects shows that the procurement of government procurement is not completely random. This policy contains many useful products for the market. Valuable information. The acquisition of government orders by enterprises is equivalent to an official affirmation of their own R&D technical level and application for subsidized research projects, which undoubtedly conveys a positive signal of corporate technological superiority and good credit background. Whether external investors use the government's technology procurement supply unit as a useful information resource for their credit decision can effectively avoid the adverse selection problems that may be faced. ②After the company obtains the government order, the government will conduct effective dynamic supervision and management of its project implementation, further standardize and guide the enterprise to carry out continuous R&D and innovation activities, which can alleviate the moral hazard problems that external investors may face. ③Innovative purchase orders can be regarded as government-to-business intangible credit guarantees. Aided enterprises are the key targets of government support and attention. They can reduce the risk assessment of external investors to enterprises, make them more stable expectations for the repayment of corporate credit funds, and increase the trust of external investors in assisted enterprises. And investment confidence.

In summary, the dual signals of government credit-based technology certification and regulatory certification released by the government's innovative purchase orders have enabled market investors to give higher credit recognition based on trust in government evaluation. Promote the continuous investment of other enterprises, financial institutions and social funds, and finally form a stable diversified innovation investment fund support chain. In turn, it effectively alleviates the problem of insufficient R&D financing.

4.2 Interactive feedback mechanism

In the modern economy, users and open collaborative innovation have gradually replaced the manufacturer's innovation model. More and more practice clearly shows that the role of users (demand side) in the process of innovation generation and improvement is becoming increasingly important. This phenomenon is partly due to the asymmetry of information, that is, users and producers often have different information. Product developers need two types of information to do their job: "requirements and application environment information" (provided by the user) and "general solution information" (originally usually provided by the manufacturer working on a particular solution). Combining these two types of information is not

easy, they are usually very sticky. Thus, the degree of interaction between users and producers has a major impact on reducing innovation costs and innovation risks.

Information interaction in procurement can create an environment of trust, reduce opportunism, and reduce the need for expensive oversight and exchange-related general transaction costs in the context of information asymmetry. Under the PPI policy, the establishment of a stable network of purchase and sales relationships has made it necessary for both parties to communicate frequently because the two parties are stakeholders. Early contact with suppliers can also gain industry knowledge that is not available internally to develop better bid specifications, feedback on user experience information during the innovation process, and mastery of the latest scientific and technical information from suppliers. It is possible to continuously exchange information between the two parties, thereby promoting iterative innovation and optimization and upgrading of products.

Interactive learning refers to the process of learning and communicating between multiple participants in the PPI process to improve innovation and adjust innovative behaviors and activities, including between different suppliers, between supplier companies and public procurement organizations, or two. The interaction between the person and the agent. Interactive learning is an essential factor for innovation. Learning between different suppliers will stimulate innovative ideas and shape innovative thinking, and encourage suppliers to conduct more innovative actions. Continuous communication between supplier companies and public procurement organizations. It will improve the accuracy of the supplier's demand for the project. If negative feedback is obtained, it will help the supplier to correct the innovation and the innovation goal, and enhance the innovation efficiency. If positive feedback is obtained, the internal opportunity of the supplier enterprise Greatly enhanced, it will better accomplish the innovation goal; if there is an intermediary, the intermediary can serve as a content expert to make up for the capacity gap between the two parties, to impart expertise to suppliers and public procurement organizations, or as a project manager to participate in the management of the procurement process. And communication, reduce the cost of interaction between supply and demand, and further improve the technical and organizational capabilities of the two, can promote the smooth development of innovative actions. This kind of interactive learning method has no external restrictions and requirements. Supplier companies can control their own innovative behaviors and activities, have greater flexibility, and have a higher sense of internal control and self-efficacy.

4.3 Innovation generates a diffusion mechanism

Commercialization of research and development results is a necessary condition for innovation. PPI transforms innovation into innovative goods through transaction realization effect. The completion of transaction and the

completion of product delivery indicate that the research and development results in the previous stage have been commercialized and innovation has been directly generated, but transaction realization is a complicated process.

PPI achieves innovation diffusion through learning effects and signal effects. Learning effect refers to the feedback of public procurement on innovation results. It has potential value for promoting further optimization and improvement of innovation results and lowering production cost, and lays a foundation for product promotion. Signal effect refers to public organizations in the process of innovation promotion. The act of purchasing and applying innovation, this process sends signals to potential users and even potential imitators, forms a demonstration, promotes the formation of more imitative innovators and purchase followers in society, and promotes the diffusion of innovation between technology and market. That is to say, the evolution of innovation results and the expansion of market size.

5. Conclusions and recommendations

In general, although the theoretical sources of public innovation procurement can be traced back to innovative system ideas and related models, subsequent theoretical developments and policy practices ignore the role of demand-side policies in the innovation policy system. Since the 1990s, traditional supply-side innovation policies have performed poorly in meeting the challenges of globalization, providing a soil for the "revival" of demand-side innovation policy theory. Through the combing and analysis of relevant research literatures, it is not difficult to find that as one of the core tools for the revitalization of demand for innovation policy, the policy value of public innovation procurement has been widely recognized by policy makers and innovative scholars. Public innovation procurement with public procurement transactions as the carrier to meet the needs of the public sector and promote technological innovation is sufficient in terms of theoretical basis and policy basis: it is beneficial to alleviate market failures and system failures, and is conducive to enhancing regional innovation vitality and building Leading the market is conducive to creative improvement of public service efficiency; public innovation procurement with public purchasers, innovation providers and intermediaries as the main participants is essentially a coupling process between the procurement process and the innovation process, in the process of promoting technological innovation of enterprises. There are three kinds of mechanisms: motivation incentive mechanism, interactive feedback mechanism and innovation generation diffusion mechanism. The soundness of the above mechanism fundamentally determines the policy effect of public innovation procurement.

References

- [1] KESTENBAUM M I, STRAIGHT R L. Procurement performance: Measuring quality, effectiveness, and

- efficiency [J]. *Public Productivity & Management Review*, 1995, 19 (2):200-215.
- [2] Ai Bing, Chen Xiaohong. The relationship between government procurement and independent innovation [J]. *Management World*, 2008 (3): 169-170.
- [3] Tian Yishun. Research on Government Procurement System Supporting Independent Innovation Products [D]. Wuhan: Wuhan University of Technology, 2009.
- [4] Sun Leichao. Empirical Research on the Impact of Chinese Government Procurement on the Development of High-tech Industry [D]. Shanghai: Donghua University, 2014.
- [5] ASCHHOFF B, SOFKA W. Innovation on demand—Can public procurement drive market success of innovations? [J]. *Research Policy*, 2009, 38 (8): 1235-1247.
- [6] CORREIA F, HOWARD M, HAWKINS B, et al. Low carbon procurement: An emerging agenda [J]. *Journal of Purchasing & Supply Management*, 2013, 19 (1): 58-64.
- [7] Hu Wei. Public Technology Procurement as an Innovation Policy Tool [J]. *Studies in Science of Science*, 2004, 22 (1): 43-46.
- [8] Huang He. Functional Orientation of Western Government Procurement Policy and Its Enlightenment [J]. *Journal of Nanjing Normal University (Social Science Edition)*, 2006 (6): 63-67.
- [9] SIEMIATYCKI M. Implications of private-public partnerships on the development of urban public transit infrastructure: The case of Vancouver [J]. *Journal of Planning Education & Research*, 2006, 26 (2): 137-151.
- [10] LEMBER V, KALVET T, KATTEL R. Urban competitiveness and public procurement for innovation [J] *Urban Studies*, 2011, 48 (7): 1373-1395.
- [11] UYARRA E, EDLER J, GARCIA-ESTEVEZ J, et al. Barriers to innovation through public procurement: A supplier perspective [J]. *Technovation*, 2014, 34 (10): 631-645.
- [12] Song Hefa, Mu Rongping, Ren Zhongbao. Research on the Relevance of Government Procurement Policies and Implementation Details to Promote Independent Innovation [J]. *Studies in Science of Science*, 2011, 29 (2): 291-299.
- [13] Guo Bao, ZhuoXiangzhi, Gong Bing. Government procurement supports enterprises' innovation Mechanism Study [J]. *Journal of Huaibei Normal University (Philosophy and Social Sciences Edition)*, 2014 (3): 66-70.
- [14] Chang Chao, Wang Tieshan, Wang Zhao. Government procurement promotes independent innovation of enterprises New Experiences for Reference [J]. *Economic Perspective*, 2008 (8): 100-103.
- [15] Guo Wen, Cheng Yu, Ren Zhongbao. Research and Enlightenment of Foreign Government Procurement Incentive Policy [J]. *China Science and Technology Forum*, 2011 (9): 146-151.
- [16] Ai Bing. Research on the Characteristics of Japanese and Korean Government Procurement to Promote Independent Innovation [J]. *Journal of Hunan University of Science & Technology (Social Science Edition)*, 2012, 15 (1): 94-98.
- [17] Aschhoff B, Sofka W, Innovation on demand - can public procurement drive market success of innovations? [J]. *Research Policy*, 2009,38(8): 1235-1247.
- [18] Edler J, Georghiou L, Public procurement and innovation-resurrecting the demand side [J]. *Research Policy*, 2007,36(7): 949-963.

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