

Research on the Evolution, Evaluation, and Optimization of the R&D After-Subsidy Policy in Wenzhou

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Abstract

This study analyzes Wenzhou's R&D after-subsidy policy through a three-dimensional analytical framework—"Policy Evolution, Implementation Evaluation, and Countermeasure Optimization." It systematically outlines the development trajectory, incentive mechanisms, and supervisory measures of the policy from 2018 to 2025. The findings indicate that the policy initially relied primarily on pre-tax additional deduction subsidies, transitioned into a deepening phase characterized by differentiated incentives, and later evolved into a refined stage employing a segmented "existing-increment" subsidy approach. These progressive measures have gradually enhanced enterprise R&D investments, the commercialization of technological achievements, and overall market competitiveness. However, despite a significant increase in the number of high-tech enterprises and R&D expenditures, challenges remain regarding the precision of incentive targeting, the stability of fund disbursement, and the comprehensiveness of full-process supervision. Based on these insights, the study proposes countermeasures, such as establishing a multi-layered incentive system, improving information-based supervision, and implementing dynamic evaluation mechanisms. These recommendations aim to provide both theoretical foundations and practical guidance for optimizing regional R&D subsidy policies, thereby supporting high-quality, innovation-driven regional development.

Keywords

R&D after-subsidy; technological innovation; Wenzhou.

1. Introduction

China's economy has fully entered a phase of high-quality development and stands at a critical juncture of transforming its development model, optimizing its economic structure, and shifting its drivers of economic growth. Endogenous growth theory suggests that sustainable economic growth can only be achieved by continually promoting technological progress. From an economic perspective, technological innovation exhibits significant quasi-public good characteristics. Its non-competitive and imperfectly excludable nature results in the social returns of private investment exceeding individual returns, indicating a market failure that necessitates governmental intervention.

Currently, the Chinese government's innovation subsidy system showcases considerable diversity. The traditional ex-ante subsidy model often suffers from low fund utilization efficiency and discrepancies between project outcomes and expectations. In contrast, the ex-post R&D subsidy mechanism provides precise support during the output stage of innovation through a results-oriented allocation of funds, representing a new approach to enhancing fiscal efficiency.

As a major hub of the private economy, Wenzhou has, in recent years, intensified its innovation-driven development strategy by fortifying ex-post R&D subsidy policies to stimulate enterprise

innovation. In 2023, the municipal government introduced the "Several Policy Opinions of the Wenzhou Municipal People's Government on Accelerating Technological Innovation to Promote High-Quality Industrial Development," implementing a combined policy of "tax incentives plus special subsidies." This includes various forms of ex-post subsidies such as technological transformation investment subsidies and innovation platform performance awards. Nevertheless, regional innovation ecosystems still face prominent challenges, including insufficient R&D investment intensity, suboptimal technological platform capacities, and imbalanced talent structures. Moreover, the actual effectiveness of ex-post subsidy policies in stimulating enterprise innovation and optimizing resource allocation efficiency has yet to reach academic consensus.

In this context, this study develops a three-dimensional analytical framework—"policy evolution, implementation evaluation, and policy optimization"—aimed at addressing key issues such as coherence of policy objectives, adaptability of subsidy instruments, and effective implementation of ex-post subsidy policies. The goal is to provide both theoretical support and practical guidance for improving the policy innovation governance system and enhancing policy targeting, thereby advancing the deeper implementation of the regional innovation-driven development strategy.

2. Literature Review

Research both domestically and internationally on the relationship between government subsidies and corporate technological innovation has established a relatively systematic theoretical framework. Numerous scholars (e.g., Kleer R. 2008^[1]; Mei Bingjing and Luo Jianchao 2020^[2]; Jiang Anxuan and Zheng Jun 2019^[3]) have indicated that government subsidies can significantly increase corporate investment in basic and applied research, thereby enhancing technological innovation capabilities. Furthermore, some studies (e.g., Guellec 2003^[4]; Li Wenjing and Zheng Mannie 2016^[5]; Wang Yu and Tang Jiahong 2018^[6]) have pointed out that the relationship between government subsidies and technological innovation is nonlinear, with the positive effects being limited by certain thresholds beyond which inhibitory effects may occur.

Comparative studies on ex-ante and ex-post subsidies reveal that ex-ante subsidies are more influential in reducing financial risks for companies, while ex-post subsidies, which represent governmental recognition of corporate R&D activities, exhibit stronger motivating effects (Czarnitzki and Kraft 2004^[7]). In summary, although government subsidies hold potential in promoting corporate technological innovation, their implementation process faces challenges such as improper selection of subsidy targets and imprecise subsidy amounts (An Tongliang et al. 2009^[8]).

China began exploring the ex-post R&D subsidy mechanism relatively late, with related research primarily focusing on analyses of the pros and cons of the policy and comparisons of its current implementation state. The advantages of ex-post subsidies lie in their ability to secure funding, emphasize results-oriented support, and simplify the management process. However, significant drawbacks also exist, including the potential abandonment of R&D projects in the event of funding shortages, insufficient support for basic research, and a lack of stimulation for the innovative capabilities of research personnel.

The deficiencies in existing research are mainly reflected in the following aspects. First, there is an insufficient decomposition of policy elements; previous studies have treated subsidy policies as homogeneous tools without a micro-level dissection of components such as selection criteria for subsidy targets, tiered incentive mechanisms, and dynamic adjustment rules. Second, research on regional innovation systems is weak, with most regional case studies remaining at the level of policy text description, lacking systematic evaluation of the linkage

effects among policy instruments, innovative actors, and industry ecosystems. Third, there is a deficiency in assessing long-term impacts, as most quantitative studies rely on cross-sectional data, making it difficult to reveal the phase-specific characteristics of policy evolution and its cumulative effects on regional innovation capabilities.

Based on existing research, this paper attempts to combine a longitudinal analysis of the evolution of ex-post R&D subsidy policies in the Wenzhou region with a cross-sectional comparison, thereby providing a new perspective for the construction of regional innovation systems.

3. Development Characteristics of Wenzhou's Ex-Post R&D Subsidy Policy

In 2016, Zhejiang Province initiated ex-post R&D subsidy work. The document "Several Opinions on Addressing the Shortcomings of Technological Innovation" (Zhe Zhengban Fa [2016] No. 75) clearly stipulated the establishment of an ex-post R&D subsidy system for enterprises, whereby companies eligible for the R&D expense additional deduction tax incentive policy would receive subsidies proportional to their actual R&D expenditures. In January 2018, Zhejiang Province further defined the management of such subsidies by issuing the "Management Measures for Provincial-Level Enterprise Ex-Post R&D Subsidy Funds." In Wenzhou, the document "Notice of the Wenzhou Municipal Committee of the Communist Party and the Wenzhou Municipal Government on Issuing Several Policy Opinions on Accelerating the High-Quality Development of the Industrial Economy" (Wen Wei Fa [2018] No. 44) explicitly provided for ex-post R&D subsidies. Between 2018 and 2025, a total of 14 policies involving "post-investment R&D subsidies" were introduced at the municipal level. This paper analyzes the development characteristics of Wenzhou's ex-post R&D subsidy policy from the dimensions of policy evolution stages, subsidy objectives, subsidy standards, subsidy principles, and eligibility conditions. All the data in this study are sourced from official publications such as the Wenzhou Statistical Yearbook, the Wenzhou Statistical Bulletin on National Economic and Social Development, and the China Torch Statistical Yearbook.

3.1. Funding Allocation and Incentive Approaches: From Pilot Exploration to Fine-Grained Tiering

The development of Wenzhou's ex-post R&D subsidy policy can be divided into three distinct stages:

First Stage (2018–2019): This initial phase saw the introduction of four policies and the launch of incentive measures centered on subsidies following tax-pre-deduction adjustments. Once companies' R&D expenditures were certified by the tax authorities, they received a subsidy at a rate of 10% for expenses up to RMB 3 million. Additionally, tiered rewards were provided for the first set (or system) of R&D equipment, basic research projects, and significant innovation achievements (e.g., national-level awards). The hallmark of this stage was the preliminary establishment of the system with relatively singular incentive measures, yet it already embodied the dual approach of combining awards with subsidies.

Second Stage (2020–2022): This deepening phase focused on promoting high-quality industrial development and introduced constraints related to "enhancing R&D intensity." During this period, three policies were revised or introduced. In addition to maintaining the previous mechanism of rewarding additional deductions for R&D expenditures, special subsidies were introduced to support enterprises in establishing their own R&D institutions (such as corporate research institutes or R&D centers), key platforms, and major breakthrough projects. For example, for enterprises within the "one zone, one corridor" framework, not only were R&D investment thresholds set, but subsidies were also tied to the actual project investments, thereby implementing differentiated rewarding mechanisms. Moreover, responding to the

developmental needs of emerging sectors such as industrial software and the digital economy, special support policies were formulated. This stage marks a transition from a “single subsidy” to a “multifaceted incentive” approach and from broad-spectrum subsidies to more precise, targeted support.

Third Stage (2023–2025): In this fine-tuning phase, seven policies have been revised or introduced. Specifically, Wenzhou has incorporated a segmented subsidy mechanism distinguishing between “stock” and “incremental” components. For enterprises recorded on the online direct reporting platform and verified to meet the criteria, portions of the previous year’s R&D expenditures exceeding RMB 2 million are subsidized at a rate of 3% for the stock component and 8% for the incremental component, with the total subsidy capped at RMB 3 million. At the same time, random verifications and enhanced data monitoring measures have been implemented to improve the transparency and precision of fund disbursement. Furthermore, for key high-tech industries such as new energy, industrial software, and other strategic sectors, policies have been tailored further regarding reward intensity, application standards, and implementation processes—thereby enhancing the overall specificity and operational effectiveness of the incentives.

3.2. Diversification of Policy Types and Evolution of Policy Document Attributes

An analysis of the policy document attributes reveals that the types of Wenzhou’s ex-post R&D subsidy policies are diverse, as illustrated in Table 1. The primary issuer of these policies is the Wenzhou Municipal Government, with contributions from the Wenzhou Science and Technology Bureau and the Wenzhou Municipal Committee of the Communist Party. Specifically, 13 policies were independently issued and 1 policy was jointly issued. The types of government documents mainly include notifications, opinions, proposals, and administrative methods—each of which features strong operability. Among these, notifications account for 8 policies (57.14%), proposals and administrative methods 1 each (7.14%), and opinions 4 (28.57%). In terms of policy focus, 6 policies (42.86%) are classified as special policies, while 8 policies (57.14%) are comprehensive. This diversification in policy document types not only reflects Wenzhou’s continuous exploration in identifying incentive subjects, setting subsidy standards, and optimizing implementation procedures, but also lays a solid foundation for subsequent dynamic adjustments and systematic improvements of the policy framework.

Table 1 Statistics on policy distribution

Type		Stage 1 (2018-2019)	Stage 2 (2020-2022)	Stage 3 (2023-2025)	Total
Number of Policies		4	3	7	14
Body of Policy Enactment	Independent	3	3	7	13
	Enactment				
	Multi-sectoral enactment	1	0	0	1
Type of policy text	Notification	3	1	4	8
	Opinions	1	1	2	4
	Programs			1	1
	Measures		1		1
Classification of Policy	Specialized Policies	1	2	3	6
	Comprehensive				
	Policy	3	1	4	8

3.3. Enhanced Targeting and Flexibility of the Subsidy Policy

Wenzhou's ex-post R&D subsidy policy has evolved from universal measures to differentiated support tailored to specific technological fields and industries. In the second phase of the policy, emerging sectors such as the digital economy and new energy were explicitly incorporated into the policy scope, with distinct subsidy standards designed to address the diverse R&D needs of various industries. Initially, the policy primarily relied on a fixed percentage subsidy; however, as the market and technological environments evolved, it shifted towards a combined approach, utilizing pre-tax additional deduction incentives alongside extra project-related rewards to implement a "company-specific" strategy. This transformation reflects Wenzhou's increasing emphasis, based on accumulated policy experience, on targeting and flexibly incentivizing corporate R&D investments and technological breakthroughs while ensuring fiscal security and maximizing the incentive effect.

3.4. Gradual Perfection of Supporting Management Mechanisms and Supervision Systems

Wenzhou's ex-post R&D subsidy policy not only emphasizes direct financial support but also places significant importance on establishing robust supporting management and supervisory systems. From the certification and declaration of R&D expenditures to the construction of corporate R&D institutions, the operation of innovation platforms, and the continuous dynamic monitoring of major breakthrough projects, the advantages of multi-departmental coordination and collaborative management among municipal and county (district) authorities are evident. Each stage of the policy stresses the establishment of comprehensive inspection and supervision frameworks, networked data statistics, and random verification mechanisms to effectively prevent fraudulent claims and ensure the safe and efficient use of funds. Furthermore, Wenzhou has actively explored new tools—such as innovation vouchers, R&D service agencies, and incentive contests—to build a comprehensive service system that combines fiscal and tax incentives, direct subsidies, and other supporting measures, thereby further promoting effective policy implementation.

3.5. Incentive Effects and Outcome Feedback Propel Dynamic Policy Adjustments

At every stage, Wenzhou's ex-post R&D subsidy policy has aimed to encourage enterprises to increase their R&D investments and strengthen technological breakthroughs through a mix of direct financial support and outcome-based incentives. Following policy implementation, enterprises that received benefits in the form of additional R&D expense deductions, equipment rewards, and project subsidies experienced a marked increase in both R&D intensity and technological innovation outputs. The government continuously collects feedback regarding enterprise declarations, fund utilization, and performance evaluations, making dynamic adjustments to policy standards, procedures, fund supervision, and reward effects. This integrated model of incentives and oversight has not only effectively stimulated internal R&D motivation within enterprises but has also provided valuable insights for constructing a sustainable, long-term incentive mechanism.

3.6. Gradual Formation of Phased Objectives and a Long-Term Incentive System

Overall, the evolution of Wenzhou's ex-post R&D subsidy policy follows a logical progression from "pilot guidance to comprehensive rollout and finally to precision incentives." The initial phase focused on awakening R&D enthusiasm among enterprises, the intermediate phase emphasized platform construction and key project breakthroughs, and the later phase has built on earlier achievements by further institutionalizing and systematizing the mechanisms. The policy has expanded its focus from key regions (such as "One Zone One Corridor," major

industrial parks, and pilot zones for advanced manufacturing and industrial transformation) to encompass the entire city and critical sectors. By integrating financial subsidies, tax incentives, and regulatory assessments, the policy has established a relatively mature incentive framework that continuously promotes corporate technological innovation. This stepwise, forward-moving policy design, which is highly aligned with the direction of industrial transformation, not only provides robust support for addressing shortcomings in enterprise R&D but also accumulates valuable experience for exploring and refining R&D incentive mechanisms.

4. Wenzhou's Ex-Post R&D Subsidy Policy: Practical Outcomes

4.1. Expansion of Scale and Steady Increase in R&D Investment

Table 2 Status of Enterprise Innovation and Development in Wenzhou (2018–2023)

	2018	2019	2020	2021	2022	2023
High-tech Enterprises	1114	1816	2403	3087	3712	4321
Provincial-level High-tech Enterprise R&D Centers	358	414	484	492	373	469
Provincial-level Technology-based SMEs	6216	8429	10340	12571	14730	14155
Industrial Enterprise R&D Expenditure (in 10,000 yuan)	1053438	1121672	1225196	1388079	1583467	1660497
Government Funding for Industrial Enterprise R&D (in 10,000 yuan)	8838	14657	8861	10698	10686	5971

Based on Table 2, the number of high-tech enterprises in Wenzhou increased rapidly from 1,114 in 2018 to 4,321 in 2023, nearly tripling. The number of provincial-level technology-based SMEs (representing the scale of innovative enterprises) also doubled. Meanwhile, the number of provincial-level high-tech enterprise R&D centers rose from 358 in 2018 to 469 in 2023, providing strong support for enterprises in technological breakthroughs and the construction of innovation platforms. Additionally, industrial enterprise R&D expenditure climbed from 10.534 billion yuan to 16.605 billion yuan, achieving an overall growth of 57.6%. Despite fluctuations in government support funds, enterprises' independent R&D investments continued to grow at an average annual rate of about 9.5%, fully demonstrating their robust internal innovation drive.

4.2. Enhanced Technology Outcome Transformation and Market Competitiveness

Table 3. High-tech Innovation in the High-tech Zone (2018–2022)

	2018	2019	2020	2021	2022
High-tech Zone Corporate Technology Revenue (in 100 million yuan)	261.48	371.45	271.66	288.77	398.64
High-tech Product Exports (in 100 million yuan)	38.2	53.4	60.9	72.3	81.4

According to Table 3, Wenzhou's ex-post R&D subsidy policy has achieved significant results in promoting the transformation of technological outcomes and enhancing the market competitiveness of enterprises. For example, in the high-tech zone, corporate technology revenue increased from 261.48 (100 million yuan) in 2018 to 398.64 (100 million yuan) in 2022, a growth of 52.5%. Similarly, the export value of high-tech products rose from 38.2 (100 million yuan) in 2018 to 81.4 (100 million yuan) in 2022, an increase exceeding 113%, reflecting a sustained improvement in core technologies and product quality among Wenzhou enterprises in the global market.

4.3. Continuous Accumulation of Patents and Innovation Outcomes

Table 4. Technology Output and Technology Market Situation in Wenzhou (2018–2023)

	2018	2019	2020	2021	2022	2023
Number of Authorized Patents (items)	38181	37009	52199	61313	55500	48747
Valid Invention Patents (items)	10405	12846	17036	21446	25045	28323
Number of Technology Contracts (items)	1979	1817	4974	7580	6664	7384
Technology Transaction Volume (in 10,000 yuan)	1621998	2103200	2199983	2402720	3309700	4961674

In terms of patent and technology market transformation, the innovation achievements in Wenzhou have been highly significant. Table 4 indicates that both the number of authorized patents and the number of valid invention patents have exhibited an upward trend year by year. The quantity of valid invention patents expanded from 10,405 in 2018 to 28,323 in 2023, with an average annual growth rate of approximately 22%, and the proportion of valid invention patents among all authorized patents rose markedly. Meanwhile, the number of technology contract projects and the technology transaction volume increased by nearly threefold and 206%, respectively; in 2023, the technology transaction volume experienced a year-on-year increase of 50%. These trends clearly demonstrate that Wenzhou enterprises are gradually forming a healthy ecosystem for the market-oriented transformation of technological achievements and high-value innovation.

5. Issues in Wenzhou’s Ex-Post R&D Subsidy Policy

5.1. Precision of Incentives Needs to be Improved

Although the subsidy policy is largely results-oriented, there is insufficient refinement in the identification of eligible recipients and the segmentation of funding tiers. While the policy has gradually shifted from universal support to differentiated incentives since its pilot phase, the design of subsidy amounts remains relatively uniform for enterprises of different sizes, industry characteristics, and R&D stages, making it difficult to fully meet the individualized and multi-level R&D support needs of various entities.

5.2. Insufficient Stability and Predictability in the Disbursement of Funds

The data indicate that overall enterprise R&D investments show an upward trend; however, government subsidy amounts have fluctuated and even declined at times, potentially affecting enterprises’ R&D initiatives and sustained investment. Moreover, with fixed funding standards and a lack of custom “stock-increment” design, it becomes challenging to promptly adjust the subsidy intensity and structure when an enterprise’s overall R&D capacity improves or its risk-bearing capacity for projects is insufficient.

5.3. Room for Improvement in Full-chain Management and Supervision Mechanisms

Although various stages have explored measures such as spot checks, direct reporting via networked systems, and data monitoring, full-chain supervision of fund usage remains vulnerable to risks of false reporting and opaque fund flows. Cross-departmental and cross-level regulatory and collaborative management require more refined informatization and risk early-warning systems to ensure that subsidy funds truly serve their incentivizing purpose and to prevent resource wastage.

5.4. Need for Improvement in Dynamic Feedback and Real-time Evaluation Mechanisms

Current policy revisions are largely based on periodic summaries and lack a real-time, dynamic evaluation framework. This shortfall prevents the timely alignment of enterprises' actual R&D outputs, patent quality, and technology contract transaction volumes with the subsidy effects, leading to some policies not being sufficiently flexible in response to the rapidly changing technological market environment.

6. Policy Recommendations for Wenzhou's Ex-Post R&D Subsidy Policy

6.1. Establish a Differentiated, Multi-tiered Subsidy Incentive System

Develop multi-level and multi-indicator subsidy standards based on enterprise attributes, industry characteristics, and R&D stages. Tailor incentive policies specifically for large enterprises, technology-based SMEs, and emerging technological fields to ensure that targeted subsidies truly achieve their intended effect.

6.2. Enhance the Stability and Predictability of Government Fund Disbursement

It is advisable to formulate medium- to long-term funding plans and risk early-warning mechanisms and to adjust subsidy amounts and structures in a timely manner in accordance with the progress of enterprise R&D and market demand. This approach, taken while ensuring fiscal security, will provide enterprises with stable, continuous policy support and enhance the continuity and foresightedness of their R&D efforts.

6.3. Improve the Informatized Management and Supervision Mechanism for the Entire Process and Full Chain

Utilize big data and informatization platforms to enable dynamic supervision of project applications, fund disbursement, execution tracking, and performance evaluation. By employing advanced risk early-warning and spot-check mechanisms—and possibly involving third-party evaluation agencies—the linkage between policy execution and enterprises' actual R&D outcomes can be closely monitored to ensure safe and transparent use of funds.

6.4. Construct a Dynamic and Real-time Evaluation System

Establish an evaluation system that incorporates multiple quantitative and qualitative indicators—such as R&D investments, technological outcomes, patent quality, and the effectiveness of technology market transformation—to achieve real-time tracking and feedback on policy implementation. Based on evaluation results, adjust subsidy policies and management guidelines promptly to enhance policy responsiveness and adaptability.

6.5. Formulate Special Support Plans for Emerging Technological Fields

In alignment with the development needs of strategic emerging industries such as the digital economy, industrial software, and new energy, design flexible and diverse ex-post subsidy policies. Such policies should not only meet the funding requirements for cutting-edge technological R&D but also facilitate the transformation and upgrading of traditional industries, thereby further enhancing the region's core competitiveness.

7. Conclusion

This study constructs a three-dimensional analytical framework—"Policy Evolution, Implementation Evaluation, and Countermeasure Optimization"—to systematically outline the development trajectory, practical outcomes, and existing challenges of Wenzhou's ex-post R&D

subsidy policy. The findings indicate that since 2018, Wenzhou has progressively established and refined a subsidy system characterized by “pre-tax additional deductions” as its foundation and differentiated incentives as its hallmark. This policy has significantly stimulated corporate R&D activity and enhanced the efficiency of technology transfer, as evidenced by key data showing that the number of high-tech enterprises has increased nearly threefold, annual growth in industrial R&D expenditure averages 9.5%, and technology transaction volume has risen by 206%. These figures underscore the positive impact of the policy on the regional innovation ecosystem.

However, challenges persist in the implementation of the policy, including insufficient targeting of incentives, instability in fund disbursement, and weakened comprehensive oversight mechanisms. These issues hinder the further enhancement of policy effectiveness. To address these challenges, this paper recommends establishing a differentiated and tiered incentive system, strengthening dynamic information-based oversight, and creating a medium- to long-term funding planning mechanism. The aim of these proposals is to achieve precise policymaking and effective management, balancing the universality of policies with the specific needs of various industries while improving the efficiency of public fund utilization.

The practices in Wenzhou provide valuable insights for the design of R&D subsidy policies in other regions: firstly, there is a need to focus on the iterative development of policy tools and to dynamically adjust incentives in alignment with regional industrial characteristics; secondly, enhancing cross-departmental collaboration and data-driven oversight is essential in constructing a closed-loop management system for “application-evaluation-feedback”; thirdly, it is critical to emphasize long-term support for basic research and emerging technological fields to promote the deep integration of innovation chains and industrial chains. Future research could further explore the cumulative effects of post-subsidy policies on regional innovation capabilities and their long-term impacts on micro-level enterprise innovation behaviors, thereby providing theoretical support for improving the innovation governance system characteristic of China.

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