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Research on the Coordinated Development Mechanism Between Industrial Policy and Technological Innovation: A Case Study of Xiangjiang New Area, Hunan

Yan Chen*, Xiaoxiao Gao, Xia Wu, Yatian Zeng, Yifan Lin

Hunan University Science and Technology City Doctor-Technology Co., Ltd., Changsha 410000, China
Correspondence Author

Abstract: ***In the context of the accelerating global technological revolution and industrial transformation, the coordinated development of technological innovation and industrial policies has become a key factor in regional high-quality development. This paper takes the Xiangjiang New Area as an example to explore the interactive mechanisms between industrial policies and technological innovation, and constructs a dynamic analysis framework of "policy supply-innovation-driven-industrial upgrading-response dptimization". The study shows that Xiangjiang New Area has achieved significant results in policy system construction and innovation capacity enhancement, but still needs optimization in terms of policy coordination, precision, and dynamism. Drawing on the experiences of other new areas, it is proposed that optimization should be advanced from aspects such as policy coordination, technology finance, innovation platforms, talent mechanisms, and institutional guarantees, in order to build an efficient "policy-innovation-industry" coordination mechanism to promote the high-quality development of regional economies.***

Keywords: Industrial Policy; Technological Innovation; Coordination Mechanism; Xiangjiang New Area; Regional Innovation.

1. INTRODUCTION

In the context of the accelerating global technological revolution and industrial transformation, technological innovation has become a core element in regional and national competition, while industrial policy serves as a crucial tool for guiding the allocation of innovation resources, shaping the innovation ecosystem, and enhancing regional competitiveness [1]. A dual-cycle relationship has emerged between the two: On one hand, sound and rational industrial policies can guide innovation entities in conducting technological research and development and achieving transformation through institutional supply, fiscal support, and resource allocation. On the other hand, breakthroughs in technological innovation, in turn, promote industrial structure adjustments and policy system optimization, forming a virtuous cycle of interactive innovation development [2].

In the context of the national promotion of new quality productivity and the modernization of industrial systems, the collaborative development of industrial policies and technological innovation at the regional level has become a key support for driving high-quality development. In recent years, several national-level new districts in China have become important experimental zones for exploring this mechanism. The Xiangjiang New Area, as the core zone of the Chang-Zhu-Tan National Regional Science and Technology Innovation Center and the leading area for Changsha's development as a global R&D hub, is currently at a crucial stage of deep integration between industrial transformation and technological innovation. Since its establishment, significant achievements have been made in the construction of industrial policy systems and the enhancement of technological innovation capabilities. However, as national-level new districts enter the "post-policy dividend" phase, the challenge of achieving high-efficiency coupling between industrial policies and technological innovation through institutional innovation, factor coordination, and mechanism optimization has become a pressing issue for the Xiangjiang New Area and the regional innovation systems across the country.

Therefore, researching the mechanisms of coordinated development between industrial policies and technological innovation not only helps to summarize the policy practices of the Xiangjiang New Area, providing theoretical support and decision-making basis for local governments to improve policy systems, but also holds significant importance for promoting the formation of innovation growth poles in central China and exploring the implementation pathways for the national innovation-driven development strategy. This study takes the

Xiangjiang New Area as a case to explore the interactive mechanisms between policy systems and innovation systems, aiming to reveal the dynamic coupling relationships between policy supply, technological innovation, and industrial development, and to provide replicable and scalable theoretical and practical paradigms for the construction of regional innovation hubs.

2. THEORETICAL FOUNDATION AND ANALYTICAL FRAMEWORK

2.1 The Intrinsic Logic of Industrial Policy and Technological Innovation: Guiding Role and Response Mechanisms

First, industrial policy has a significant guiding role in technological innovation. As an essential tool for governments to adjust economic structures and guide industrial upgrades, the core function of industrial policy lies in promoting the aggregation and flow of innovation elements through resource allocation, institutional supply, and incentive orientation. From the perspective of resource allocation, industrial policies provide the necessary material foundation for technological innovation by optimizing the business environment, regulating market order, and guiding industrial upgrading [4][5][6]. This resource guidance helps reduce R&D risks for enterprises and stimulates the vitality of technological innovation. Second, from the perspective of institutional supply, industrial policy constructs the institutional framework for regional innovation ecosystems through institutional innovation [8][9]. In fields where traditional market mechanisms have yet to fully function, government institutional supply compensates for market failure. This institutional arrangement not only optimizes the flow mechanism of innovation resources but also enhances policy predictability and the innovation confidence of enterprises. Third, from the perspective of incentive orientation, industrial policy guides the direction of innovative behavior through multi-dimensional incentive mechanisms involving talent, platforms, and enterprises [10]. These measures demonstrate that industrial policy is not only a provider of external incentives but also serves as the "navigator" of the regional innovation system.

Second, technological innovation has a response mechanism for the optimization of industrial policy. Technological innovation is not only a result of policy guidance but also a driving force for the continuous optimization of the policy system [11][12]. First, from the perspective of technological breakthroughs, the emergence of new technologies often disrupts existing industrial structures and policy frameworks, prompting governments to adjust the direction of industrial policies [13]. Second, from the perspective of industrial upgrading, technological innovation, by improving total factor productivity, leads to the reconstruction of industrial and innovation chains, forcing the optimization and upgrading of the policy system [14]. Finally, from the perspective of policy experiments and institutional innovation, technological innovation provides a "testing ground" for industrial policy. As an important platform for institutional innovation, national-level new districts have relatively strong policy flexibility and inclusiveness, enabling them to continuously experiment with, verify, and optimize policy tools in the process of technological innovation activities [15][16].

In summary, a positive response loop of "policy driven-innovation breakthrough-policy optimization" is formed between industrial policy and technological innovation. Policies provide direction and resources for innovation, while innovation, through results transformation and industrial upgrading, reversely promotes the improvement and evolution of the policy system. These interactions together contribute to the continuous optimization of the regional innovation ecosystem.

2.2 Theoretical Model of Collaborative Development Mechanisms

Based on the aforementioned theoretical foundation, this study argues that there exists a significant coupling relationship between the industrial policy toolkit and the innovation factor system. In current academic discourse, industrial policy instruments are generally categorized into three types: supply-side policies, demand-side policies, and environmental policies [17][18]. Supply-side policies focus on directly providing inputs essential for innovation, such as R&D funding, scientific equipment, the construction of science parks, and talent recruitment [19]. Demand-side policies stimulate the application of innovative outcomes by leveraging market forces through government procurement, standard-setting, and demonstration projects [20]. Environmental policies emphasize the optimization of the innovation environment, including legal protection, intellectual property rights (IPR) safeguarding, the cultivation of innovation culture, and improvements in the overall business environment [21].

Correspondingly, the core components of the technological innovation system include technology, talent, capital, and platforms [22][23]. The effective application of policy instruments essentially entails the optimized allocation

and efficient coupling of these innovation factors. For instance, supply-side policies interact with technological elements to support sustained R&D investment and breakthroughs; demand-side policies are closely linked to capital elements by directing investment flows through market signals; environmental policies support talent and platforms by fostering a stable and open innovation environment [24]. When the policy toolkit aligns with the innovation factor system, a virtuous cycle of "policy-resources-innovation" can emerge, enhancing the overall performance of the innovation system. Conversely, if policy design is misaligned with innovation demands, it may lead to resource misallocation and diminished innovation efficiency [25]. The experience of the Xiangjiang New Area highlights that the precise coupling between policies and innovation elements is essential to realizing the collaboration between technological innovation and industrial development.

Drawing upon this theoretical logic and empirical insights from the Xiangjiang New Area, this study develops a dynamic analytical framework of "policy supply-innovation driven-industrial upgrading-response dptimization" to elucidate the mechanism underlying the collaborative development of industrial policy and technological innovation. This study develops a dynamic analytical framework of "policy supply, innovation driven, industrial upgrading, response optimization" to capture the mechanism underlying the collaborative development between industrial policy and technological innovation. **In the first stage of policy supply**, the government acts as both an institutional designer and a resource allocator, issuing a series of policies to support technological innovation, industrial development, and financial incentives, thereby providing institutional and material safeguards for innovation actors. For example, in 2023, the Xiangjiang New Area introduced 17 policy documents supporting enterprises, covering industrial subsidies, financial services, and the commercialization of research outcomes, thus forming a comprehensive policy portfolio. **The second stage, innovation driven**, is characterized by the agglomeration and coordination of key innovation elements (including technology, talent, capital, and platforms) under policy incentives. The Xiangjiang New Area has actively promoted this process by attracting high-level talent through the "Xiangjiang Talent Plan," directing financial resources to tech enterprises via a "Sci-tech Finance Risk Compensation Mechanism," and fostering deep integration among industry, academia, and research through collaborative platforms. This stage emphasizes the formation of innovation momentum and the nurturing of a vibrant innovation ecosystem. **In the third stage of industrial upgrading**, technological achievements are transformed into industrial applications, catalyzing the restructuring and advancement of industrial and value chains. For instance, policies aimed at supporting the intelligent connected vehicle industry in Xiangjiang have enabled coordinated progress across vehicle production, component manufacturing, infrastructure deployment, and testing services, resulting in the initial formation of an industrial cluster. This reflects the tangible impact of innovation outcomes on structural industrial optimization and showcases the collaboration between policy and innovation. Finally, **the fourth stage, response optimization**, involves policy refinement and institutional innovation driven by emerging demands and challenges from industrial development. In Xiangjiang, enterprise response collected during policy implementation has encouraged financial authorities to engage early in the policy design process, enabling the simultaneous release of policy documents and implementation guidelines. This has significantly improved both the precision and operability of policy interventions, reinforcing a virtuous cycle of adaptive governance.

3. DEVELOPMENT STATUS OF INDUSTRIAL POLICIES AND TECHNOLOGICAL INNOVATION IN XIANGJIANG NEW AREA

3.1 Evolution of the Policy System Before and after the "Three-in-One" Integration

Since its establishment, the Xiangjiang New Area has undergone a transition from fragmented administration to systematized governance. In particular, following the "Three-in-One" integration in April 2022, which unified the Xiangjiang New Area, Changsha High-Tech Industrial Development Zone, and Yuelu Zone, the industrial policy system and technological innovation governance have become highly integrated, laying a solid institutional foundation for policy coordination and innovation agglomeration.

On one hand, prior to the "Three-in-One" integration, the policy system of the Xiangjiang New Area exhibited significant fragmentation. YueLu District, Changsha High-Tech Industrial Development Zone (High-Tech Zone), and the Yuelu Mountain University Science and Technology Town each formulated their own independent policy systems. While these efforts yielded certain achievements, issues such as redundant constructions and lack of coordination were prevalent. YueLu District focused on the transformation of scientific and technological achievements; the High-Tech Zone emphasized industrial clustering and platform construction, introducing a series of specialized industrial policies; the University Town promoted the integration of government, industry, academia, and research to facilitate the local transformation of university-based research outputs. However, due to

the multiplicity of policy actors and inconsistent standards, overlapping policies and disconnected implementation across regions created a fragmented landscape, weakening policy transmission and reducing the efficiency of resource integration.

On the other hand, the post-integration period marked the onset of policy system unification. After the integration, the Xiangjiang New Area restructured its policy system with the High-Tech Zone as the core, establishing a "policy-institution-mechanism" three-dimensional framework for science and technology innovation and industrial development. The current policy system in the New Area covers six major domains: scientific achievement transformation, industrial development, talent cultivation and attraction, financial services, infrastructure empowerment, and enterprise quality enhancement. As of 2024, 51 policy documents have been reviewed, among which 24 are currently valid, accounting for 47% of the total. The New Area's policy system exhibits three prominent characteristics: (1) enhanced systematization and coordination; (2) improved specialization and precision; and (3) gradual refinement of policy implementation and evaluation mechanisms. This systematic policy supply has effectively eliminated local policy fragmentation, providing institutional guarantees for the collaborative development of industrial policy and technological innovation.

3.2 Characteristics of Technological Innovation Development

As the core area for scientific and technological innovation in Hunan Province, the Xiangjiang New Area has gradually formed a multi-level, full-chain innovation system.

First, the innovation actors have become increasingly diversified. The New Area has gathered a wide range of innovation entities, including universities, research institutes, technology enterprises, and industrial parks. The Yuelu Mountain University Science and Technology Town concentrates academic and research resources from top universities such as Central South University, Hunan University, and Hunan Normal University. Meanwhile, Changsha High-Tech Zone is home to leading innovation enterprises such as Zoomlion Heavy Industry Science & Technology, Anker Innovations Technology, Lens Technology, and Sansure Biotech. By the end of 2023, the New Area had established a tiered innovation enterprise structure, ranging from "fledgling enterprises" to "gazelle companies," "little giants," and publicly listed firms, effectively enhancing regional self-innovation capacity.

Second, the ability to transform research outputs has been significantly strengthened. The New Area introduced a set of policies for "Supporting the Localized Transformation of High-Quality Scientific and Technological Achievements", which improve mechanisms for intellectual property confirmation, transformation funding, and the development of shared platforms. Between 2022 and 2023, over 44 million yuan in transformation funding was allocated, supporting more than 100 projects and greatly accelerating the industrialization of scientific research outputs. Mechanisms such as "open competition for the best solutions" (jiebang guashuai) have driven breakthroughs in critical bottleneck technologies, especially in engineering machinery, promoting deep integration of academia, industry, research, and application.

Third, the construction of innovation carriers and the supporting ecosystem has accelerated. The New Area has established a series of innovation platforms including the Changsha Information Industry Park, Yuelu High-tech Zone, the Yuelu Mountain University Science and Technology Town, and is expediting the development of Xiangjiang Science City, forming a cluster of innovation carriers integrating R&D, incubation, and transformation. On the financial side, a technological finance system represented by the Hunan Financial Center and Xiangjiang Fund Town is gradually taking shape. Platforms like "Credit-Easy-Loan" and risk compensation mechanisms have effectively alleviated financing difficulties for small and medium-sized tech firms, fostering a dual-engine innovation ecosystem driven by "technology finance and innovation platforms."

3.3 Industrial Development and Structural Upgrading

The industrial structure of the Xiangjiang New Area is undergoing a transition from traditional manufacturing to intelligent manufacturing and high-end services. Centered on the construction of a modern industrial system, the New Area has prioritized the development of strategic industrial clusters, including artificial intelligence, intelligent manufacturing equipment, construction machinery, modern finance, biomedicine, and new materials. In alignment with Hunan Province's "4×4" modernization industrial strategy, the New Area has proposed the development of ten key industrial chains and has introduced a series of targeted policies covering sectors such as biopharmaceutical industry and advanced manufacturing.

At the same time, technological innovation has emerged as a key driver of industrial upgrading. Policies such as the Several Measures for Promoting High-Quality Development of Advanced Manufacturing support enterprises in establishing innovation centers and public technology platforms. Likewise, the Several Measures for Promoting the High-Quality Development of the Intelligent Connected Vehicle Industry promote the construction of testing scenarios and demonstration applications, aiming to build a complete industrial ecosystem. The R&D investment of local enterprises continues to rise, with some sectors achieving technological outputs at the leading domestic level. A synergistic development pattern has gradually taken shape, linking the innovation chain, industrial chain, capital chain, and talent chain, which serves as a new engine for high-quality economic growth in the region.

3.4 Collaborative Characteristics of Regional Technological Innovation

Under the guidance of an increasingly integrated policy framework, Xiangjiang New Area has developed a multidimensional collaborative pattern that links policy, innovation, and industry. First, at the policy coordination level, cross-departmental collaboration has become more robust, forming a working system characterized by fiscal leadership, scientific and technological guidance, and industrial cooperation. Second, in terms of innovation chain coordination, cooperation among universities, research institutes, and enterprises has deepened, while pilot testing platforms and commercialization bases have accelerated the application of research outcomes. Third, on the industrial chain side, key industrial clusters have increasingly overlapped and converged, particularly in areas such as intelligent manufacturing and information technology, as well as artificial intelligence and the automotive sector, leading to the emergence of collaborative development ecosystems. This evolving collaborative structure reflects a shift in Xiangjiang New Area from policy-driven innovation to mechanism-driven innovation, offering a replicable model for other central regions to explore effective coordination between industrial policy and technological innovation.

Overall, Xiangjiang New Area has established a relatively complete system that integrates industrial policy and technological innovation. The policy framework has evolved from fragmentation to integration, the innovation system has advanced from simple factor agglomeration to systemic coordination, and the industrial structure has upgraded from traditional manufacturing toward more intelligent and high-end sectors. Nevertheless, further improvements are still needed in several areas, including the scope of specialized policy instruments, the depth of financial support, and the effectiveness of policy evaluation and response mechanisms. By enhancing institutional innovation, the New Area can further promote the integration of industrial, innovation, capital, and talent chains, thereby supporting high-quality regional economic development.

4. MECHANISM ANALYSIS OF THE SYNERGISTIC DEVELOPMENT BETWEEN INDUSTRIAL POLICY AND TECHNOLOGICAL INNOVATION IN THE XIANGJIANG NEW AREA

4.1 Mechanisms Through Which the Policy System Promotes Technological Innovation

In the Xiangjiang New Area, industrial policies promote technological innovation through three key mechanisms: institutional provision, factor allocation, and incentive orientation. Together, these mechanisms form a virtuous cycle of “policy-driven innovation.”

The first mechanism involves institutional provision, which focuses on the development of a coordinated policy framework and interdepartmental implementation. Since the “Three-in-One” integration, the New Area has developed a systematized policy framework. Policies such as the Several Measures for Promoting the Construction of a Frontier Science and Technology Innovation Hub ensure vertical alignment and horizontal coordination across departments. Financial, science and technology, and industrial authorities jointly participate in policy evaluation and implementation, forming a closed-loop system that spans from policy design to delivery. This approach marks a shift from fragmented support to coordinated and strategic policy guidance.

The second mechanism centers on factor allocation, optimizing the distribution of resources such as capital, talent, and innovation platforms. The New Area enhances the configuration of innovation factors by investing funds, attracting talent, and empowering platforms. In 2023 alone, over 4.8 billion yuan in policy funds were allocated, with approximately one-third directed toward science and technology innovation and the commercialization of research outcomes. The “Xiangjiang Talent Plan” has brought in high-level researchers and innovation teams. Platforms such as Changsha Information Industry Park, Yuelu High-tech Zone and Yuelu Mountain University

Science and Technology City have become hubs for the convergence of talent, technology, and capital, fostering an endogenous mechanism of "factor coupling and collaborative innovation."

The third mechanism emphasizes incentive orientation, using financial instruments and tailored incentives to stimulate innovation behavior among enterprises. The New Area has adopted a tiered and categorized approach to innovation incentives, combining rewards with subsidies and offering tailored support to enterprises at different stages of development. Financial tools such as commercialization funds, interest subsidies on technology loans, and risk compensation mechanisms have been introduced to encourage proactive innovation behaviors and strengthen a positive response loop between policy support and enterprise innovation.

4.2 Response Mechanisms of Technological Innovation on Industrial Policy Optimization

Technological innovation is not only driven by policy but also plays an active role in shaping and refining it. One important pathway is through the emergence of new innovation outcomes, which often prompt timely policy updates. For example, as technological breakthroughs continue to emerge in fields such as intelligent connected vehicles and biomedicine, the Xiangjiang New Area has introduced supporting policies that reflect a shift from broad-based, inclusive support to more targeted and precision-oriented instruments.

Another channel of response lies in industrial upgrading. In sectors such as construction machinery, enterprise-led technological innovation has accelerated the digital transformation of the industry. In response, local policy support has evolved from single-point subsidies to more integrated, value-chain-oriented measures. This dynamic interaction has fostered a circular mechanism in which "policy facilitates innovation, innovation drives industrial upgrading, and upgraded industries, in turn, reshape policy".

In addition, policy experimentation based on innovation activities has served as a catalyst for institutional reform. The New Area has treated technological innovation as a testing ground for advancing new policy approaches, exploring mechanisms such as the separate management of scientific achievements and liability exemptions for research personnel acting in good faith. A closed-loop policy management system, comprising application, evaluation, implementation, and response, has been gradually established, enabling the policy framework to remain adaptive and responsive to evolving innovation dynamics.

4.3 Institutional Environment for Policy-innovation Collaboration

The Xiangjiang New Area has developed a relatively mature collaborative institutional environment in areas such as government leadership, market mechanisms, interdepartmental coordination, and the construction of an innovation ecosystem.

One key aspect is the balance between government and market. The New Area adheres to the principle of "government guidance, enterprise leadership, and market-driven growth". By strategically using fiscal funds to attract social capital, it has established a science and technology finance system that combines "fiscal guidance and market investment," effectively enhancing resource allocation efficiency.

Another important aspect is interdepartmental coordination. The New Area has established a "special task force for coordinating industrial policies," which operates under a "unified leadership, tiered responsibility, and collaborative advancement" framework. This approach ensures the sharing of information across departments such as finance, science and technology, and organization, preventing "information silos" and improving policy implementation and enterprise satisfaction.

Finally, there is open collaboration within the innovation ecosystem. Through a collaborative mechanism involving government, industry, academia, research, finance, and service sectors, the New Area has effectively brought together resources from universities, research institutions, innovation funds, and intermediary service agencies. The Yuelu Mountain University Science and Technology Town focuses on scientific research and innovation, the Xiangjiang Science City is responsible for research commercialization and pilot testing, and the Lukou Enterprise Plaza facilitates industrial applications, collectively creating a synergistic effect across the innovation chain.

4.4 Characteristics and Summary of the Collaborative Mechanism

The collaborative mechanism between industrial policy and technological innovation in the Xiangjiang New Area is characterized by three main features: systematization, dynamism, and interactivity. Systematization is reflected in the multi-layered integration of the policy framework and innovation elements. Dynamism is evident in the continuous response and adjustments between policy and innovation. Interactivity is shown in the collaborative cooperation among diverse stakeholders, including the government, enterprises, universities, and financial institutions.

This collaborative mechanism has driven the transformation of the Xiangjiang New Area from a "policy-driven innovation" model to a "mechanism-driven innovation" approach. It has facilitated the development of a dual-cycle model, where policy activates innovation and innovation, in turn, feeds back into policy. This model provides a replicable example for other central regions to explore the integrated development of industrial policy and technological innovation.

5. BENCHMARK ANALYSIS: INSIGHTS FROM ADVANCED NEW AREAS

In order to deepen the understanding of the industrial policy and technological innovation synergy mechanism of the Xiangjiang New Area, this paper conducts a comparative study of representative national-level new areas such as the Tianfu New Area in Sichuan and the Xixian New Area in Shaanxi, as well as industrial development and innovation-leading clusters such as the Huangpu District in Guangzhou and the High-tech Zone in Hefei. The comparison reveals that these regions have developed relatively mature collaborative models in areas such as policy system construction, technological finance innovation, platform and carrier development, and talent ecosystem cultivation. Their experiences provide valuable insights for improving the "policy-innovation-industry" linkage mechanism in the Xiangjiang New Area.

The Tianfu New Area in Sichuan focuses on the transformation of achievements and the strengthening of industrial chains. It has established a full-chain innovation system from "basic research, R&D, incubation, commercialization". By setting up special funds for the transformation of scientific and technological achievements and reward funds for equity participation, it has implemented a "competitive bidding and post-event subsidies" mechanism, significantly improving the rate of transformation. At the same time, the region has implemented the "chain leader system" to promote collaboration among leading enterprises, universities, and research institutions, achieving deep integration of policy, innovation, and industry. The experience in Tianfu New Area shows that a mechanism driven by achievement transformation, supported by industrial chain collaboration, is an important path to achieving a positive cycle between policy and innovation.

The Huangpu District in Guangzhou has formed a systemic advantage in building an innovation ecosystem and talent system. Its "1, 10 and N" policy framework covers the entire cycle from R&D to market launch for enterprises, establishing a comprehensive talent support system with policies like the "18 Measures for Huangpu Talent" and the "Scientist Program". The district has formed a multi-level collaborative model of "policy clusters and innovation platforms" by combining fiscal support with living amenities, resulting in deep integration of the talent chain, innovation chain, and industry chain, providing sustained momentum for regional innovation. This demonstrates that a well-established innovation ecosystem and a high-level talent system are foundational conditions for policy-innovation collaboration.

The High-Tech Zone in Hefei is notable for its "dual-engine" mechanism, driven by technological finance and industry. The region pioneered the "government, bank, insurance, foundation" collaborative system, setting up multi-layered guiding funds and risk compensation mechanisms. This has promoted the collaboration between fiscal funds and social capital, forming a "policy guidance, capital propulsion, industrial breakthrough" development model. In emerging strategic sectors such as integrated circuits, quantum information, and new energy vehicles, Hefei High-Tech Zone has effectively addressed the financing challenges faced by small and medium-sized tech enterprises through policy-finance linkage, thus creating a sound technological finance ecosystem.

The Xixian New Area in Shaanxi is known for its "policy-platform integration" approach, adopting a "coordinated planning, differentiated policy implementation and dynamic adjustment" model. The area operates under a dual-subject management system, combining the "management committee and platform company" structure to improve policy implementation efficiency and platform effectiveness. By linking financial support with performance, the New Area has established an integrated innovation chain from "R&D, incubation, commercialization". This experience shows that innovation platforms are not only an essential carrier for policy

implementation but also a key medium for policy optimization and institutional innovation.

Through the comparative analysis, it is evident that the four new districts share several common patterns in their collaborative development of industrial policy and technological innovation: First, the policy systems are structured and dynamic, with performance evaluation and regular adjustment mechanisms in place; second, technological finance is deeply embedded, with effective interaction between fiscal funds and social capital; third, innovation platforms are operated systematically, becoming the core of policy transmission and resource integration for innovation; fourth, the linkage between talent and innovation fosters a positive cycle in the regional innovation ecosystem; and fifth, data-driven response and closed-loop management are implemented between policy execution, innovation activities, and industrial development.

Drawing from these experiences, the Xiangjiang New Area should focus on four key areas for optimization: First, constructing a dynamic policy system and establishing a "formulation, execution, response, optimization" closed-loop mechanism; second, strengthening technological finance support by improving the interaction between investment and loans, and establishing risk compensation systems; third, building high-level innovation platform clusters, with Xiangjiang Science City serving as the core, to integrate the full chain from "research, incubation, transformation, industrialization"; fourth, upgrading the talent innovation ecosystem by improving incentives for research achievement transformation and innovation entrepreneurship support systems.

In conclusion, the common logic in these advanced new districts lies in the scientific design of policy systems, market-oriented innovation mechanisms, systematic financial support, and collaborative ecological environments. These experiences provide actionable pathways and practical references for the Xiangjiang New Area to further improve its industrial policy system, strengthen its innovation-driven force, and achieve high-quality regional development.

6. CONCLUSION AND OUTLOOK

Based on the previous analysis, it is evident that the collaborative framework between industrial policy and technological innovation in the Xiangjiang New Area has been initially established. However, the systematization, precision, and dynamism of the policy system still need further enhancement. Drawing lessons from the advanced experiences of the Tianfu New Area, Huangpu District in Guangzhou, Hefei High-Tech Zone, and Xixian New Area, and considering the actual conditions of the Xiangjiang New Area, the system optimization should focus on five key areas: policy system, financial support, innovation platforms, talent mechanisms, and institutional innovation. This will help build an efficient, interactive, and continuously evolving "policy-innovation-industry" collaborative mechanism.

First, a collaborative and efficient policy system should be established. A cross-departmental "policy coordination task force" should be set up to promote information sharing and joint decision-making among departments such as science and technology, finance, industry, and finance. This will ensure full-process coordination from policy formulation to evaluation. A digital policy management platform should be built to visualize and automate policy implementation. Additionally, the policy system should shift from "dispersed support" to "systematic guidance", creating a "industrial chain, innovation chain, policy chain" collaborative mechanism that provides targeted and precise support aligned with the industrial system of the Xiangjiang New Area.

Second, the technology finance support system should be improved. Drawing from the "government-bank-insurance-foundation" model in Hefei High-Tech Zone, a technology finance system combining fiscal funds and social capital should be established. A "Xiangjiang Technology Innovation Guidance Fund" could be set up to address financing challenges for technology enterprises through mechanisms such as risk compensation, investment-loan linkage, and intellectual property pledge. The "Credit-easy-loan" platform should be upgraded to enable digital management of financing, creating a "fiscal guidance, financial support, innovation-driven" capital cycle.

Third, innovation platforms and carriers should be strengthened. The construction of the Xiangjiang Science City should be accelerated to create a high-level innovation platform integrating research, incubation, and transformation. By leveraging the research resources of Yuelu Mountain University Science and Technology Town and the High-Tech Zone, key laboratories, engineering centers, and common technology platforms should be built. A classified management approach should be applied to platforms, enhancing the conversion functions of integrated platforms and focusing specialized platforms on key technologies in the industrial chain, forming a

complementary and synergistic structure.

Fourth, talent and innovation ecosystem should be further developed. The "Xiangjiang Talent Plan" should be upgraded to build a full-cycle talent support system from "discovery-recruitment-cultivation-transformation" and encourage researchers to invest in enterprises using their research achievements, thus sharing the benefits. Drawing from Huangpu District's experience, improvements in housing, healthcare, and education should be made to create an inclusive and open innovation environment, enhancing the stability of talent innovation.

Fifth, institutional innovation and collaborative governance mechanisms should be improved. A multi-stakeholder governance structure, with the government in the lead and enterprises and research institutions involved, should be established. Expert consultations and third-party evaluations should be introduced, forming a "formulation-execution-feedback-optimization" closed-loop management system. Institutional innovations in intellectual property operations, research achievement ownership, and data element circulation should be explored, driving dynamic policy optimization.

In summary, the Xiangjiang New Area should achieve breakthroughs in three areas: systematization, precision, and institutionalization. The level of systematization should be enhanced through cross-departmental collaboration and policy integration. Precision should be improved by offering targeted, tiered policies. Institutionalized support should be established through financial linkages and institutional innovation.

From the research conclusions, it is clear that the collaborative development of industrial policy and technological innovation is inherently logical. Industrial policy promotes innovation through institutional provision and incentive orientation, while technological innovation feeds back into policy optimization through achievement transformation and industrial upgrading, forming a cyclic mechanism of "policy driven, innovation breakthrough, policy re-optimization". The practice of the Xiangjiang New Area shows that the deep coupling of policy and innovation is key to driving high-quality regional economic development.

In the future, the Xiangjiang New Area should continue to strengthen the dynamic policy system and technology finance support, build comprehensive innovation platforms, deepen talent innovation strategies, and promote the construction of a regional collaborative innovation network. This will create a development model characterized by "policy precision, open innovation, and collaborative governance". Through institutional innovation and policy coordination, the Xiangjiang New Area is expected to become a high-tech innovation hub and a policy innovation demonstration zone in Central China, providing a "Xiangjiang model" for China's regional coordinated development and innovation-driven strategy.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest relevant to this study.

REFERENCES

[1] Yuan B. & Zhang Y. (2020). Flexible environmental policy, technological innovation and sustainable development of China's industry: The moderating effect of environment regulatory enforcement. Journal of Cleaner Production, 243, 118543.
[2] Wang J., Ma X., Zhao Y., Zhao J. & Heydari M. (2022). Impact of scientific and technological innovation policies on innovation efficiency of high-technology industrial parks - A dual analysis with linear regression and QCA. International Journal of Innovation Studies, 6(3), 169-182.
[3] Johnstone P., Rogge K. S., Kivimaa P., Fratini C. F. & Primmer E. (2021). Exploring the re-emergence of industrial policy: Perceptions regarding low-carbon energy transitions in Germany. Energy Research & Social Science, 74, 101889.
[4] Hassel A., Naczyk M. & Wiß, T. (2019). The political economy of pension financialisation: public policy responses to the crisis. Journal of European Public Policy, 26(4), 483-500.

[5] Zhao M., Xiao X., Yang J. & Chen H. (2024). Do regional tax incentive policies improve productivity? Plos One, 19(8): e0307561.
[6] Bezemer D., Ryan-Collins J., Lerven F. V. & Zhang L. (2023). Credit policy and the 'debt shift' in advanced economies, Socio-Economic Review, 21(1), 437-478.
[7] Lu D. (2001). Industrial policy and resource allocation: implications on China's participation in globalization. China Economic Review, 11(4), 342-360.
[8] Tang Y., Hu X., Petti C. & Thürer M. (2020). Institution-driven innovation in Guangdong firms: Moderating effects of in-house formal R&D and industrial environment turbulence. Science and Public Policy, 47(2), 194-206.
[9] Uyarra E., Zabala-Iturriagagoitia J. M., Flanagan K. & Magro E. (2020). Public procurement, innovation and industrial policy: Rationales, roles, capabilities and implementation. Research Policy, 49(1), 103844.
[10] Damayati A., Nuryakin C., Yudhistira M.H., et al. (2024). Industrial location policy, exporting activity, and firms' collusive behavior: scrutinizing the unintended effect of industrial location policy in Indonesia. Journal of Industrial and Business Economics, 51, 815-858.
[11] Zhong M., Lu Q. & He R. (2022). The heterogeneous effects of industrial policy on technological innovation: Evidence from China's new metal material industry and micro-data. Resources Policy, 79, 103107.
[12] Yang H. & Umair M. (2024). Polluting industries: Does green industrial policy encourage green innovation? Chinese perspective evidence. Heliyon, 10(17), e36634.
[13] Herman K. S., Hall J. K., Sovacool B. K. & Iskandarova M. The industrial decarbonization paradigm: Carbon lock-in or path renewal in the United Kingdom? Ecological Economics, 235, 108628.
[14] Sharif N. & Huang Y. (2019). Achieving Industrial Upgrading Through Automation in Dongguan, China. Science, Technology and Society, 24(2), 237-253.
[15] Zheng L., Abbasi K. R., Salem S., et al. (2022). How technological innovation and institutional quality affect sectoral energy consumption in Pakistan? Fresh policy insights from novel econometric approach. Technological Forecasting and Social Change, 183, 121900.
[16] Ghazinoory S., Nasri S., Afshari-Mofrad M. & Moghadam N. T. (2023). National Innovation Biome (NIB): A novel conceptualization for innovation development at the national level. Technological Forecasting and Social Change, 196, 122834.
[17] Chen X., Maddi A. & Wang Y. (2025). How China Governs Open Science: Policies, Priorities, and Structural Imbalances. Publications, 13(3), 30.
[18] Cai Y., Li L., Elahi E. & Qiu Y. (2018). Selection of Policies on Typhoon and Rainstorm Disasters in China: A Content Analysis Perspective. Sustainability, 10(2), 387.
[19] Shen C., Yang Z. & Zhan J. (2025). Analysis of China's marine economic policy: Regional policy characteristics, evolution and assessment. Frontiers in Marine Science, 12.
[20] Ninni A., Lv P., Spigarelli F., et al. (2020). How home and host country industrial policies affect investment location choice? The case of Chinese investments in the EU solar and wind industries. Journal of Industrial and Business Economics, 47, 531-557.
[21] Meckling J. (2021). Making Industrial Policy Work for Decarbonization. Global Environmental Politics, 21(4), 134-147.
[22] Pan J., Wang G. & Lu X. (2022). "Break the four only" and "establish new standards" based on five value orientations. Chinese Science Bulletin, 67(3), 236-241.
[23] Miao W., Zang H., Liu Q., et al. (2025). From chaos to symbiosis: Exploring adaptive co-evolution strategies for generative AI and research integrity systems. BMC Med Ethics, 26, 120.
[24] Wang B. & Xing Q. (2022). Evaluation of the Wind Power Industry Policy in China (2010-2021): A Quantitative Analysis Based on the PMC Index Model. Energies, 15(21), 8176.
[25] Jing R., Xu Y. & Liu R. (2025). Data element, big data and enterprise innovation: Evidence from data trading platforms and national big data comprehensive pilot zones. International Review of Financial Analysis, 105, 104426.