

Research on the Innovation Path and Differentiation Strategy of Low-Altitude Economic and Industrial Integration Development in Sichuan Province

Dan Wu, Guoqing Chen*

School of Finance, Chengdu Jincheng College, Chengdu, Sichuan, 611731, China

ABSTRACT

As a new economic form that relies on low-altitude airspace resources and deeply integrates the whole chain of "R&D, manufacturing, operation services, and scenario applications", the low-altitude economy is a strategic choice for Sichuan Province to cultivate new momentum for economic growth and promote regional coordinated development. Based on the theory of industrial integration and regional comparative advantage, this paper systematically analyzes the characteristics of low-altitude economic and industrial integration in the core urban area, resource-rich area and agriculture-dominant county in Sichuan Province through field visits and written investigations. The study identifies four core problems: insufficient industrial chain coordination, shallow technology application, homogeneity of application scenarios, and lagging airspace management coordination. Combined with regional endowment differences and the latest policy orientation, this paper proposes three innovation paths to optimize the industrial chain with "cross-regional industrial alliance", break through data barriers with "digital middle platform + smart scheduling", and cultivate new formats with "government-enterprise collaborative scenario incubation". And provide reference for similar regions in the central and western regions.

KEYWORDS

Low-altitude economy; Industrial integration; Regional differentiation; Innovation path

1 Introduction

With the inclusion of the low-altitude economy into the overall situation of national strategic emerging industries, its development has become an important engine for cultivating new quality productivity and promoting the high-quality development of the regional economy ^[1]. As a pioneer area for our country's low-altitude economic development, Sichuan Province has continued to optimize its industrial ecology since becoming the first batch of low-altitude airspace collaborative management pilots in the country in 2017, and the revenue of the low-altitude economy industry has exceeded 20 billion yuan in 2024, bringing together more than 200 low-altitude equipment manufacturing enterprises and 1,419 drone operators ^[2]. In May 2025, Sichuan Province issued the "Several Policies and Measures to Support the Development of the Low-altitude Economy" (hereinafter referred to as the "Measures"), proposing 16 specific policies around five major sectors such as infrastructure, scenario application, and scientific and technological research, and plans to arrange 300 million yuan of provincial funds every year, and set up a special fund for the low-altitude economy with a total scale of 3 billion yuan (the first phase of 1 billion yuan), injecting strong impetus into industrial integration. However, Sichuan Province has complex terrain and unbalanced regional development, and the low-altitude economy is developing rapidly, but it is also facing deep-seated integration challenges ^[3]. Existing studies have not fully discussed the latest policy trends and regional differentiation strategies. Therefore, based on field visits and the analysis of the latest policy texts, this paper systematically examines the current situation and problems of the integration of Sichuan's low-altitude economy, and combines the spirit of the "Measures" to design the innovation path and differentiation strategy of "adapting measures to local conditions", in order to provide decision-making reference for Sichuan to seize the commanding heights of low-altitude economic development ^[4].

2 Current situation and problem diagnosis

As the first province in China to pilot coordinated low-altitude airspace management, Sichuan has made significant progress in the low-altitude economy since 2017. By 2024, the total number of low-altitude economic entities in the province had reached over 10,000, a 248.70% increase over the past five years. From an industrial chain perspective, midstream low-altitude product manufacturing and supporting services account for 75.53%, while upstream R&D and core components and downstream application scenarios only account for 12.15% and 12.32%, respectively. This reflects the current structural characteristics of Sichuan's low-altitude economy, which is dominated by midstream manufacturing and supporting services. In terms of regional distribution, Chengdu accounts for 70.33% of the province's low-altitude economic entities, while Mianyang and Nanchong account for 5.22% and 2.60%, respectively, demonstrating significant

* **Corresponding Author:** Guoqing Chen, chenguoqing1139@163.com

regional agglomeration ^[5]. Based on industrial agglomeration characteristics, resource endowments, and application scenarios, the province can be divided into three categories: core urban areas, resource-rich areas, and agriculturally dominated counties. A three-dimensional analytical framework, "resource endowment, technology adaptation, and synergistic effectiveness," has been constructed to provide a theoretical basis for formulating differentiated development strategies.

The core metropolitan area (Chengdu, Deyang, and Mianyang) serves as a key growth pole for the low-altitude economy, boasting significant industrial agglomeration effects. Leveraging its industrial foundation, Chengdu leads the nation in fields such as industrial drones, home to key companies such as Wofei Changkong. Shuangliu District has implemented national demonstration projects, including the regular operation of SF Express's large-scale logistics drones along the Sichuan-Tibet Highway, effectively improving logistics efficiency on the plateau ^[6]. The "civil aviation + low-altitude travel" urban commuting solution launched by Sichuan Airlines Group and Wofei Changkong has made taxi travel a reality. Deyang and Mianyang, as integral components of the Chengdu Economic Circle, play a crucial role in the development of the general aviation industry. The region boasts two national-level civil unmanned aerial vehicle test bases, Zigong and Pengzhou, providing critical support for low-altitude aircraft testing and verification.

Resource-rich regions (Panxi and Southern Sichuan), leveraging their abundant mineral and energy reserves, are focusing low-altitude economic applications on resource exploration and emergency response. Sichuan Post is actively promoting drone express delivery services, deploying them in 13 cities and prefectures, to address the "last mile" delivery challenge in remote areas. In terms of specific application scenarios, Hanyuan County in Ya'an provides cherry air transportation services, facilitating the rapid delivery of fresh agricultural products to the city ^[7]. At an altitude of 4,700 meters, Shiqu County in Ganzi County successfully achieved low-altitude delivery in a high-altitude, cold environment, demonstrating the potential of the low-altitude economy in resource-rich areas and under special conditions. However, there is still room for improvement in the depth and breadth of low-altitude applications in this region, particularly in exploring flight mechanisms for different operating scenarios within the same airspace and improving airspace navigation and surveillance ^[8].

Agriculturally dominated counties (northeastern and northwestern Sichuan), as major agricultural production areas, primarily rely on basic agricultural services for their low-altitude economies. Sichuan Province's "Guiding Opinions on Promoting the Development of the Low-Altitude Economy" explicitly calls for expanding the application of low-altitude agricultural and forestry operations and enhancing the sophistication and intelligence of agricultural aviation operations ^[9]. Furthermore, expanding the low-altitude consumer market is a key task, including promoting the development of low-altitude tourist routes and sightseeing circles in scenic spots. Beichuan County's "Beichuan from Low Altitude" cultural tourism project and Langzhong's "Ancient City from the Air" low-altitude cultural tourism initiative are both vivid examples of developing low-altitude tourism in agriculturally dominated counties. However, these regions still face challenges in increasing the added value of low-altitude applications. They need to better leverage local resource endowments and develop more distinctive and in-depth application scenarios.

Looking at the growth trend, the number of low-altitude economic entities in Sichuan Province has continued to grow over the past five years, from 5,365 in December 2019 to 18,708 in December 2024. This month-on-month growth rate has consistently been positive, indicating a steady increase in low-altitude economic entities and a continued strengthening of the industry's vitality.

3 The analysis of the innovation path of the integrated development of low-altitude economy and industry in sichuan province

To promote the high-quality integrated development of Sichuan's low-altitude economy and industry, efforts must be made to overcome the three bottlenecks of "lack of coordination, superficial applications, and homogeneous scenarios" and establish a systematic innovation pathway.

The primary approach is to build a cross-regional industrial ecosystem network with complementary functions and shared value. Currently, Sichuan's low-altitude economic development faces a structural contradiction: a disconnect between core regions and the application market. While core areas such as Chengdu, Deyang, and Mianyang host the majority of the province's R&D and manufacturing capabilities, their technological achievements are disconnected from the province's vast application market. Resource-rich regions such as Panzhihua and southern Sichuan, as well as agricultural counties in northeastern and northwestern Sichuan, possess potential for application, but are limited by their technological capacity and thus face a "shallow application" dilemma. A provincially coordinated industrial alliance is urgently needed to promote core regions as sources of innovation and high-end manufacturing, resource-rich regions to focus on testing solutions for vertical industries, and agricultural counties to develop large-scale applications and model innovation ^[10]. This approach should also stimulate the inherent momentum of cross-regional cooperation through value

chain sharing mechanisms.

The key approach lies in building a low-altitude factor value system characterized by a "data hub + intelligent scheduling." Currently, the value of low-altitude data is underutilized, resulting in numerous "data silos" across various application scenarios. A province-wide unified low-altitude economic digital platform should be established, with data standards and interface specifications established to integrate data from all dimensions of R&D, manufacturing, and operations. Customized analytical models should be developed to address the specific needs of different regions—for example, a "geological safety dynamic analysis model" for mineral resource areas and a "precision agriculture decision-making system" for agricultural counties—to transform raw data into intelligent instructions that can guide production optimization. This system should also be deeply integrated with the air traffic control system. By analyzing historical and real-time flight data, it can provide decision support for dynamic and refined airspace scheduling, fundamentally improving airspace utilization efficiency.

The fundamental approach is to promote a unique co-creation model of "government-enterprise collaboration and scenario incubation." To address the homogeneity of scenarios, an open and inclusive collaborative innovation ecosystem must be established. The government's role should shift from being a manager to being a scenario incubator, lowering the barrier to innovation by developing guidelines for the development of specialized scenarios and opening up public resources as testing grounds. Enterprises need to transform from product suppliers to industry solution providers, gaining a deep understanding of the pain points of vertical industries such as agriculture, mining, and cultural tourism. More importantly, we must establish mechanisms for public participation and value sharing, enabling end-users like farmers and cultural tourism practitioners to participate in scenario optimization and iteration, ensuring that innovative outcomes are rooted in real-world needs and fostering new low-altitude economic models with Sichuan characteristics.

These three paths support and advance each other, forming an innovative framework for the integrated development of Sichuan's low-altitude economy. They will propel the industry from tool substitution to data-driven development, and from point-based development to a systemic ecosystem.

4 Differentiation strategy analysis

Guided by a unified provincial innovation path, differentiated development strategies should be implemented based on regional characteristics to ensure precise policy implementation and efficient implementation.

Core urban agglomerations should implement a leading strategy of "strengthening supply chains, improving quality, and leapfrogging scenarios." These regions should shift from scale expansion to enhancing industrial chain resilience and cultivating an innovative ecosystem, focusing on breakthroughs in cutting-edge technologies such as eVTOL and hydrogen fuel cell engines, and participating in the formulation of national standards to gain industry influence. By cultivating "chain leader" enterprises with platform integration capabilities, they can drive the clustering and development of specialized small and medium-sized enterprises. Furthermore, they should take the lead in opening up high-end public service scenarios such as urban air transportation and medical emergency care, using complex application demands to drive technological innovation and business model iteration, thereby exploring viable models for future low-altitude cities across the province.

Resource-rich regions should adopt an integrated strategy of "deepening resource empowerment." This should prioritize promoting the penetration of low-altitude technology from auxiliary tools to production factors, achieving deep integration of exploration data with dynamic mineral resource assessment systems, and integrating drone inspections into the entire predictive maintenance process for equipment. While consolidating basic applications, they should also expand derivative scenarios such as "low-altitude + ecological restoration" and "low-altitude + energy infrastructure" to extend the technology value chain. It is also necessary to cultivate a localized service market and establish a rapid-response technical support system, reducing over-reliance on external support and fostering self-sustaining capabilities.

Agriculturally-focused counties are well-suited to implementing a comprehensive strategy of "lowering barriers to entry and cultivating distinctive characteristics." Through a combination of special subsidies, equipment-sharing platforms, and streamlined training, the barriers to technology adoption for agricultural operators will be significantly lowered. Focus will be placed on developing "low-altitude combined with cold chain logistics" to address bottlenecks in the transportation of agricultural products from villages to cities, meticulously creating distinctive products that deeply integrate low-altitude sightseeing with agricultural experiences. Furthermore, the application of low-altitude technology will be expanded in public governance areas such as rural security patrols and disaster prevention and mitigation, making the low-altitude economy both a catalyst for industrial revitalization and a new tool for modernizing rural governance.

5 Conclusions and prospects

This paper systematically analyzes the development status of low-altitude economic and industrial integration in Sichuan Province, and identifies four core challenges: industrial chain coordination, technology application depth, scenario diversity and airspace management. Based on the theory of industrial integration and regional comparative advantage, this paper proposes three innovation paths: building a "cross-regional industrial alliance", building a "digital middle platform and intelligent scheduling system", and innovating "government-enterprise collaborative scenario incubation", and tailors differentiated development strategies for core urban circles, resource-rich areas, and agriculture-dominated counties. The research shows that to promote the high-quality development of Sichuan's low-altitude economy, we must adhere to the principle of "adapting measures to local conditions, problem-oriented, and achieving win-win synergy", and fully release the development potential of low-altitude resources through institutional innovation, technological empowerment and market drive. Future research can be further deepened in the following directions: First, explore the integration point of "low-altitude economy and green and low-carbon development", such as developing new scenarios such as "low-altitude + ecosystem carbon sink monitoring" and "low-altitude + electric aircraft application demonstration"; The second is to strengthen the research on the coordinated development of low-altitude economy under the framework of the "Chengdu-Chongqing Twin Cities Economic Circle", plan the "Chengdu-Chongqing Low-altitude Economic Industrial Corridor", and realize the sharing of airspace resources and the complementarity of the industrial chain; The third is to use econometric methods, such as building panel data models, to quantitatively evaluate the actual effects of low-altitude economic and industrial integration on regional GDP growth, employment structure optimization, and industrial structure upgrading, and provide accurate empirical basis for policy iteration. In the critical period of the deepening of the "14th Five-Year Plan" in Sichuan Province, vigorously developing the integration of low-altitude economy and industry is not only a strategic choice to cultivate new momentum for economic growth, but also an important way to promote coordinated regional development, help rural revitalization, and achieve common prosperity. Through the implementation of the above-mentioned innovation path and differentiation strategy of "local policies", Sichuan Province is expected to set a benchmark in the development of low-altitude economy in the central and western regions, and form a replicable and generalizable "Sichuan experience".

Funding

This research was financially supported by Sichuan Province Key Research Base for Philosophy and Social Sciences, Sichuan Province Unmanned Aerial Vehicle Industry Development Research Center Project "Research on Innovative Path and Differentiation Strategy of Low altitude Economic Industry Integration Development in Sichuan Province" (NO: SCUAV25-C017).

About the Author

1. Dan Wu, currently a bachelor's student, specializing in Internet finance and social governance.
2. Guoqing Chen, Doctoral degree, lecturer, research interests: Economic statistics and social governance.

References

- [1] Li Jun Four Chain Collaborative Empowerment: Research on High Quality Development Strategy of Low altitude Economy for Multi path Integration [J/OL]. *Journal of Transportation Engineering and Information Technology*, 1-13 [25-10-26].
- [2] Xu Xingyu, Li Bo, Yu Qi Theoretical mechanism, practical challenges and paths of empowering rural revitalization with low altitude economy [J]. *Journal of Management Cadre College of National Forestry and Grassland Administration*, 2025, 24 (03): 59-67.
- [3] Zhang Chun, Liang Kaixuan, Chen Mengke, etc Research on Low altitude Delivery in Urban Village Communities Based on UAV 3D Network Analysis [J]. *Western Journal of Human Settlements and Environment*, 2025, 40 (03): 41-48.
- [4] Fu Yuanshu Low altitude economy presses the "upgrade button" for Bashu culture and tourism [N]. *China Culture Daily*, May 29, 2025 (003).
- [5] Zhang Shoushuai, Yin Mengqi Sichuan's low altitude economy 'wings' heading towards the future [N]. *DailySichuan*, May 13, 2025 (001).
- [6] Zu Mingyuan, Fu Jiang Low altitude+tourism in Beichuan has become popular [N]. *DailySichuan*, May 9, 2025 (002).
- [7] Ouyang Rihui The operating mechanism and path selection of low altitude economy to promote new quality productivity [J]. *Journal of Xinjiang Normal University (Philosophy and Social Sciences Edition)*, 2025, 46 (01): 118-131.
- [8] Shen Yingchun Low altitude economy: "flying" out of a new track [J]. *People's Forum*, 2024,(08):74-79.
- [9] Ren Xinhui, Wang Jiarui Construction and Operation Mechanism of Urban Air Traffic Innovation Ecosystem [J]. *Science and Technology Management Research*, 2024, 44 (07): 18-26.
- [10] Xue Jinxia, Cao Chong A review of research on industrial integration theory at home and abroad [J]. *New Western*, 2019, (30): 73-74+90.