

Mechanism and Practical Path of Common Prosperity Empowered by "Low-altitude + Rural Revitalization" in Ethnic Minority Areas

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Abstract: Under the background of comprehensively promoting rural revitalization and solely promoting common prosperity, low-altitude economy, as an emerging economic form, is showing great potential to empower the development of ethnic areas. This article systematically analyzes the internal mechanism and practical paths of low-altitude economy empowering common prosperity in ethnic regions by applying theoretical tools such as inclusive growth theory and long-tail theory. The research finds that low-altitude economy can have a positive impact on common prosperity in ethnic regions through industrial empowerment, employment empowerment, public service empowerment, and collaborative empowerment. At the same time, "low-altitude + rural revitalization" empowering common prosperity in ethnic regions also faces multiple challenges such as institutional and policy constraints, infrastructure constraints, technical talent constraints, market mechanism constraints, and security social constraints. Based on this, this article proposes countermeasures and suggestions from aspects such as improving top-level design, promoting pilot demonstrations, cultivating multiple entities, strengthening technological innovation, and optimizing infrastructure.

Keywords: Low-Altitude Economy; Rural Revitalization; Ethnic Minority Areas; Common Prosperity; Empowerment Mechanism

1. Introduction

Under the background of comprehensively promoting rural revitalization and solely promoting common prosperity, low-altitude economy, as an emerging economic form, is showing great potential to empower the

development of ethnic areas [1]. The rural revitalization strategy is the overall handle for the "agriculture, rural areas, and farmers" work in the new era. Ethnic minority areas, as key regions for rural revitalization, generally face challenges such as geographical constraints, weak infrastructure, and lagging industrial development. Low-altitude economy provides new possibilities for the common prosperity of ethnic regions. Drone delivery can break through geographical barriers and provide efficient logistics services for remote mountainous areas; low-altitude tourism can transform ecological resource advantages into economic development advantages; aerial pest control can enhance agricultural production efficiency and contribute to the development of modern agriculture; emergency rescue can enhance the disaster prevention and mitigation capabilities of ethnic regions and improve public service levels [2]. In ethnic regions such as Guangxi, Yunnan, and Guizhou, the application exploration of low-altitude economy has achieved positive results. Guangxi actively explores drone logistics delivery pilot projects, providing convenient services for people in remote mountainous areas [3]; Yunnan uses helicopters, hot air balloons, etc. to develop low-altitude tourism, driving the income growth of surrounding people [4]; mountainous areas in Guizhou use drones for agricultural and forestry pest control, improving agricultural production efficiency [5]. These practices indicate that the integration of low-altitude economy and rural revitalization has a promising future. Based on this, this paper uses theoretical tools such as regional development theory and collaborative governance theory to systematically analyze the internal mechanism, practical constraints, and practical paths of low-altitude economy empowering the common prosperity of ethnic regions, providing theoretical references and practical guidance for ethnic regions to fully utilize low-altitude

economy to promote common prosperity.

2. Core Concepts and Theoretical Basis

2.1 Core Concepts

Low-altitude economy is a comprehensive economic form that is driven by low-altitude aviation activities and leads to the innovation of related industries and the application of scenarios. The airspace generally refers to the area within a vertical distance of 1000 meters from the ground, and depending on the actual conditions of the region, it can be appropriately extended to within 3000 meters [6]. From the perspective of the industrial chain, the upstream of low-altitude economy involves the research and manufacturing of aircraft, the development of air traffic control systems, etc., the middle stream involves low-altitude flight services and operations, and the downstream involves the expansion of various application scenarios and derivative services [7]. From the perspective of value creation, low-altitude economy creates economic value through technological innovation and service innovation, and at the same time generates social value, such as improving logistics efficiency, improving public services, and promoting regional coordinated development, etc [8].

Border minority areas Ethnic areas refer to the regions where ethnic minorities live in concentrated communities in China. They have the following characteristics: First, they have diverse ethnic compositions, with numerous ethnic minorities residing there and preserving unique ethnic cultural traditions; second, their geographical locations are special, mostly located in remote areas with complex natural conditions; third, they hold significant strategic importance, with some areas being border regions and serving as important barriers for national security; fourth, their economic development is relatively lagging, facing challenges such as inadequate infrastructure, severe brain drain, and lagging industrial development [9].

2.2 Theoretical Basis

The theory of inclusive growth emphasizes that economic growth should be inclusive, enabling more people to participate in the growth process and share the growth benefits [10]. The core elements of inclusive growth include: equal opportunities, ensuring that everyone has equal

chances to participate in economic development; shared outcomes, making development benefits accessible to all people; sustainability, ensuring that economic growth does not come at the expense of the environment and the interests of future generations. In the research on empowering ethnic minority areas for common prosperity through low-altitude economy, the theory of inclusive growth helps analyze how the low-altitude economy can create job opportunities, improve the accessibility of public services, and ensure that all ethnic groups can fairly share the development dividends [11].

The Long Tail Theory was proposed by Chris Anderson in 2004. It emphasizes that in the Internet era, due to the reduction of costs and the diversification of channels, personalized and niche products and services can also form a considerable market size [12]. The core idea of the Long Tail Theory is that numerous small markets combine to form a large market, and numerous small demands converge to form a large demand. The Long Tail Theory helps to analyze how the low-altitude economy can serve dispersed rural markets and remote mountainous areas, and turn the long-tail demands that were previously unprofitable due to high costs into profitable business opportunities [13].

3. Internal Logic of Common Prosperity in Ethnic Minority Areas Empowered by Low-Altitude Economy

3.1 Industrial Empowerment

The low-altitude economy promotes the industrial development in ethnic regions, laying a solid material foundation for common prosperity. Industrial revitalization is the core content of rural revitalization and an important support for achieving common prosperity [13]. The low-altitude economy can drive the improvement and efficiency enhancement of characteristic agriculture, and the development of unmanned aerial vehicle logistics enables fresh agricultural products to be quickly transported out, extending the sales radius and increasing the product value [2]. The unmanned aerial vehicle remote sensing monitoring technology provides support for precision agriculture and promotes the modernization of agricultural production methods. The low-altitude economy can promote the integrated development of the primary, secondary, and tertiary industries in rural areas. Ethnic regions

have rich tourism resources and cultural resources, and the development of low-altitude tourism provides new ways for the development of these resources [4]. Low-altitude tourism projects such as helicopter, hot air balloon, and unmanned aerial vehicle sightseeing present natural landscapes and ethnic cultures from a new perspective, attracting more tourists and driving the development of related industries. The low-altitude economy can cultivate and expand emerging industrial clusters [14]. With the development of the low-altitude economy, upstream and downstream industries such as unmanned aerial vehicle research and development, manufacturing, maintenance services, and training education have gradually gathered in ethnic regions [8]. These emerging industries not only create economic value but also drive employment growth and talent concentration.

3.2 Employment Empowerment

Employment is the most fundamental aspect of people's livelihood and an important means to achieve common prosperity. The development of the low-altitude economy has given rise to various new occupations such as drone pilots, maintenance technicians, operation administrators, and training instructors [15]. Moreover, the low-altitude economy is a technology-intensive industry, and the employees can accumulate skills through work practice, thereby enhancing their personal abilities and advancing their careers. The development of low-altitude logistics and low-altitude tourism has driven the growth of related industries such as packaging, transportation, catering, and accommodation, creating a large number of supporting jobs [6]. The expansion of the channels for selling agricultural products has improved agricultural production efficiency and increased the income of agricultural workers. The development of rural tourism has driven farmers to engage in business activities such as homestays and farmhouses, broadening the income sources of rural residents. This indirect driving effect is often more significant than the direct employment effect. The low-altitude economy has promoted the increase of entrepreneurial and innovative opportunities. The development of the low-altitude economy has lowered the barriers to entrepreneurship in remote areas [9]. The development of low-altitude tourism has provided passenger flow

guarantees for local residents to engage in entrepreneurial activities such as homestays, catering, and cultural experiences.

3.3 Public Service Empowerment

The equalization of public services is an important aspect of common prosperity and also a weak point in the development of ethnic regions [15]. The low-altitude economy has significantly improved the accessibility of medical emergency services. Ethnic regions often have vast areas and sparse populations, with uneven distribution of medical institutions, making emergency medical rescue difficult. The delivery of medical supplies by drones can break through geographical barriers and deliver emergency medicines, blood products, etc. to remote areas in the shortest time. The urban-rural and regional disparities in educational resources in ethnic regions are still significant [1]. Low-altitude logistics provides a convenient channel for the distribution of educational resources such as textbooks, teaching aids, and experimental equipment, helping to alleviate the problem of scarce educational resources in remote areas. With the help of drone technology, high-quality educational resources can be delivered to remote schools at a lower cost. The low-altitude economy has enhanced the emergency rescue and disaster prevention and mitigation capabilities [7]. Ethnic regions are prone to natural disasters, and the tasks of emergency rescue and disaster prevention and mitigation are heavy. Drones have unique advantages in disaster situation investigation, material delivery, and personnel search and rescue. In the rescue operations of earthquakes, floods, and landslides, drones have played an important role many times.

3.4 Collaborative Empowerment

The low-altitude economy enhances the comprehensive effect of common prosperity by promoting urban-rural integration and regional coordination [16]. It breaks down the dual barriers between urban and rural areas and facilitates the two-way flow of factors. Drone logistics enables rural products to easily enter the urban market, and urban resources can also flow more conveniently to rural areas. There is more frequent and close interaction of talents, logistics, and information between urban and rural areas. This factor flow helps narrow the urban-rural gap and promote the integrated

development of urban and rural areas. The low-altitude air routes connecting ethnic regions help break geographical isolation and promote personnel exchanges and economic and trade cooperation among regions. The cross-regional design of low-altitude tourism routes can integrate scattered tourism resources into high-quality tourism routes, enhancing overall attractiveness. This regional cooperation helps optimize resource allocation and achieve mutual benefit and win-win results [15].

4. Analysis of Realistic Constraints and Challenges

4.1 Institutional and Policy Constraints

At present, the specialized laws and regulations for the low-altitude economy at the national level are still under formulation, and the legal framework for low-altitude flights is not yet fully established. There are no clear legal provisions regarding the usage norms, operation standards, and flight area divisions of drones in rural and remote areas [16]. There are also issues of incompatibility among the regulations issued by different departments, causing confusion in local practice. The policies for the development of the low-altitude economy do not pay enough attention to ethnic regions and rural areas. Local governments have limited autonomy in formulating supporting policies and are unable to formulate differentiated policies based on local realities. The government procurement policies provide insufficient support for social capital to participate in the application of low-altitude economy, and the market-oriented operation model is difficult to be promoted [6]. The management of low-altitude airspace implements a strict approval system, and the flight permission approval process is complex and takes a long time. Approval for drone flight activities in rural and remote areas is even more difficult. The relevant technical standards, operation norms, and service standards for low-altitude economic applications are not yet complete [9].

4.2 Infrastructure and Resource Constraints

The construction of infrastructure such as low-altitude flight service stations, take-off and landing fields, and charging facilities is lagging behind, and coverage in ethnic areas and rural regions is severely insufficient [17]. There is a lack of standard planning and construction of

drone take-off and landing sites, which affects flight safety and efficiency. The lack of supporting facilities such as maintenance stations and storage facilities for drones also impacts logistics efficiency and service quality. Digital infrastructure is an important support for the operation of the low-altitude economy. The network coverage and communication quality in ethnic areas and rural regions are lagging behind those in developed areas [18]. The application of new-generation technologies such as 5G networks, the Internet of Things, and big data in ethnic areas is insufficient. The "digital divide" between urban and rural areas restricts the popularization of low-altitude economic services [13]. The fiscal self-sufficiency ability of ethnic areas is weak, and the funds available for low-altitude economic construction are limited. The incentive mechanism for social capital participation is not sound, and the financing channels are limited. The purchase and maintenance costs of drone equipment are high, and farmers and small-scale business entities cannot afford them.

4.3 Technical and Human Resource Constraints

The current unmanned aerial vehicle (UAV) technology is mainly designed for urban and plain areas and lacks adaptability to complex terrains such as mountains, plateaus, and canyons, as well as to harsh weather conditions [1]. Key technical indicators such as battery endurance and payload capacity of UAVs need to be improved. Technical solutions for special application scenarios such as medical emergency rescue in high-altitude areas and mountain logistics delivery are not yet mature. There are no specialized institutions for UAV technology research and development and services in ethnic regions [19]. The technical training, consultation, and evaluation service system is not complete, which affects user experience and application promotion. Ethnic regions lack the attraction of UAV technology research and development and service institutions. The problem of difficulty in "introducing and retaining" professional talents is prominent. The overall digital literacy of rural residents in ethnic regions is relatively low, and their acceptance of new technologies and applications is limited. Some people have cognitive biases or resistance towards UAV technology. The supply of digital skills training is insufficient, and the opportunities for people

to learn and use digital tools are limited [13].

4.4 Market and Mechanism Constraints

The rural markets in ethnic minority areas are scattered, with small quantities and long distances. The economic feasibility of drone logistics delivery in these areas faces challenges. Compared to urban areas, the order density in rural markets is low and the single delivery cost is high [20]. It is difficult to form a sustainable business model in the short term. The limited market size also affects the enthusiasm of social capital to enter. The low-altitude economy's development is not closely linked to the interests of farmers. In most cases, low-altitude economy enterprises operate independently and farmers passively accept services. The participation of village collective economic organizations is low and the collective income distribution mechanism is missing. The lack of this interest linkage mechanism has dampened the enthusiasm of farmers to participate. The empowerment of the low-altitude economy for rural revitalization involves multiple entities such as the government, enterprises, village collectives, and farmers [21]. Currently, the coordination mechanism among these entities is not sound. There is a lack of effective cooperation platforms and interest coordination mechanisms between the government and enterprises. There is information asymmetry and unfair benefit distribution between enterprises and farmers. The role of village collectives in coordinating and organizing is insufficient.

4.5 Safety and Social Constraints

There are certain safety risks associated with drone flights. In complex terrain conditions such as mountainous and forest areas, the risks are even higher. Equipment malfunctions, operational errors, and changes in weather conditions can all lead to accidents. Safety incidents may result in casualties and property damage, affecting the public's acceptance of drone applications [22]. Drone flights involve privacy protection issues. In rural areas, drone flights may capture images of farmers' residences and courtyards, raising privacy concerns. Some people have concerns about being "monitored" by drones. Balancing the promotion of drone applications and protecting privacy is a problem that needs to be properly addressed. Some people have cognitive biases and acceptance barriers regarding drone

applications [8]. Influenced by traditional concepts, acceptance of new technologies and new business models takes time. Some people are worried that drones will replace human employment, affecting their livelihoods. The lack of a sound social trust mechanism hinders the promotion speed of new applications [15].

5. Suggestions

First, perfect the top-level design. Strengthen institutional provision at the national level to provide policy guidance for local practices. Accelerate the improvement of the legal framework for low-altitude economy. It is suggested to expedite the formulation of special laws and regulations for the low-altitude economy, clarifying the legal status, management principles and responsibilities of low-altitude flights. In light of the characteristics of rural areas in ethnic regions, formulate differentiated management regulations to give localities more exploration space. Improve the registration and registration, flight approval, and safety supervision systems, and simplify the approval procedures in rural and remote areas. Provide preferential treatment in terms of fiscal funds, tax incentives, and financial support to the low-altitude economy in ethnic regions. Establish a special fund for the development of low-altitude economy in ethnic regions to support infrastructure construction, technological research and development, and talent cultivation. Give priority to ethnic regions in government procurement for low-altitude economic services.

Second, conduct pilot demonstrations. Select regions with mature conditions to carry out pilot projects and promptly summarize the experiences for promotion. The focus is on remote mountainous areas, border regions, and poverty-stricken areas to promote drone logistics services. Select ethnic villages with the necessary conditions to conduct pilot demonstrations of low-altitude tourism projects. Establish a mechanism for summarizing and promoting the pilot experiences. Timely summarize the successful practices and lessons learned in the pilot areas to form a replicable and scalable model. Promote typical experiences through on-site meetings and the compilation of case collections. Establish a pilot evaluation mechanism to objectively evaluate the effectiveness of the pilot projects.

Third, promote the effective participation of

multiple subjects. Cultivate diverse entities and improve the mechanism for interest linkage. Support the introduction and cultivation of low-altitude economy enterprises in ethnic regions, and encourage enterprises to set up branches and service outlets in these areas. Leverage the leading role of state-owned enterprises and leading enterprises to form an industrial agglomeration effect. Improve the cooperation mechanism between the government and enterprises. Support the development of low-altitude economy through government procurement of services and concession operations. Ensure the balance between public service attributes and market efficiency. Establish a mechanism for interest linkage among farmers. Promote organizational models such as "enterprise + cooperative + farmer", enabling farmers to share more benefits from the development of the low-altitude economy. Encourage village-level collective economic organizations to participate in the operation of the low-altitude economy and strengthen the strength of the collective economy.

Fourth, encourage technological innovation and talent cultivation. Strengthen technological research and development that suits the characteristics of ethnic regions. Encourage research institutions and enterprises to develop unmanned aerial vehicle products that are suitable for complex environments such as plateaus, mountains, and canyons. Develop simple and easy-to-use unmanned aerial vehicles suitable for rural application scenarios. Support the establishment of unmanned aerial vehicle maintenance outlets and technical service centers in ethnic regions. Promote flexible service models such as leasing of unmanned aerial vehicle technology and rent-to-purchase, to lower the usage threshold for farmers. Support ethnic regional universities and vocational schools in offering unmanned aerial vehicle-related majors or courses. Strengthen training in unmanned aerial vehicle operation, maintenance, and management, with a focus on training local farmers and young people. Establish training bases for unmanned aerial vehicle technology, to enhance the targeted nature of talent cultivation. Fifth, improve infrastructure and public services. Plan and construct infrastructure such as drone take-off and landing fields, flight service stations, and charging facilities in ethnic areas. Prioritize the layout of low-altitude logistics and emergency rescue facilities in remote

mountainous areas, border regions, and poverty-stricken areas. Strengthen the construction of digital infrastructure in ethnic areas. Build a low-altitude economic information service platform to provide services such as flight plan submission, meteorological information, and air traffic. Enhance public awareness and acceptance of low-altitude economy by conducting popular science publicity. Establish a public participation mechanism to promptly respond to public concerns. Improve the safety supervision system to ensure the controllable safety of low-altitude flights.

6. Conclusion

Based on the era background of rural revitalization and common prosperity, this paper focuses on the research theme of low-altitude economy empowering the development of ethnic areas, and uses inclusive growth and the long tail theory to analyze the internal logic of low-altitude economy empowering the common prosperity of ethnic areas from four dimensions of industry, employment, public service and coordination. The study found that low-altitude economy can provide new impetus for ethnic regions to narrow the development gap by upgrading local industries, expanding diverse employment opportunities, optimizing public services in remote areas, and promoting the two-way flow of resources between urban and rural areas and among regions. However, at present, ethnic regions still face multiple practical constraints in implementing low-altitude economy: insufficient adaptability of institutional and policy supply, complex approval procedures for airspace; lagging low-altitude supporting infrastructure and digital facility construction, with limited funds investment; insufficient supply of technology suitable for complex terrain and a prominent shortage of professional talents; weak sustainability of rural market business models, incomplete multi-party interest connection mechanism, and also existing practical problems such as flight safety, protection of people's privacy, and social perception. To fully unleash the value of low-altitude economy, this article proposes countermeasures in aspects such as improving differentiated top-level institutional design, conducting regional pilot demonstrations, building a multi-party interest connection mechanism, strengthening adaptive technology research and local talent cultivation, completing

infrastructure construction, and improving safety supervision and public awareness promotion. The research shows that low-altitude economy provides new tools for solving the geographical constraints in ethnic regions, but it cannot simply copy the urban development model. It must fully consider the real characteristics of ethnic regions, such as mountains, borders, and multi-ethnic settlements, and balance safety control, industrial development, and the interests of the people.

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