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From Land Finance to Sky Finance: State Capacity and the 2024 Turning Point in China's Low-Altitude Economy

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Abstract

China's 2024 policy inflection on the low-altitude economy marks a structural shift from security-dominated airspace control to governance-oriented, civil military coordinated allocation. This paper argues that the timing is driven less by technological breakthroughs than by macroeconomic demand: the contraction of land-based growth and local fiscal stress created incentives to monetize airspace as a new factor of production. We construct a Policy Intensity Index to identify a sharp regulatory break in 2024 and employ input output reasoning to explain the sector's high multiplier through backward linkages to advanced materials, batteries, and digital infrastructure. We further propose the Sky Finance hypothesis and illustrate it with concession-right auctions that resemble land finance. The study highlights state capacity as the binding constraint amid profitability, governance, and social-acceptance risks.

Keywords Low-altitude economy; Airspace governance; Sky finance; Policy Intensity Index; State capacity

1 Introduction: Structural Drivers of the 2024 Policy Turning Point

The year 2024 represents a decisive structural breakpoint in the history of China's aviation economy. It marks a fundamental shift in the national governance paradigm of airspace resources—from a regime dominated by singular military security priorities toward one characterized by coordinated civil–military allocation and economic utilization. For decades, China's airspace management system was defined by an overriding emphasis on air defense security, under which the People's Liberation Army (PLA) exercised stringent control over the vast majority of national airspace. While this institutional arrangement effectively safeguarded national security, it simultaneously constrained the commercial potential of general aviation (GA) and related low-altitude activities.

This long-standing equilibrium was disrupted in 2024, when the concept of the "low-altitude economy" was formally introduced into the *Government Work Report* and explicitly designated as a "new engine of economic growth." Subsequently, the Third Plenary Session of the 20th Central Committee of the Communist Party of China elevated the low-altitude economy to the level of a national strategic priority. These developments signal a profound reweighting of airspace value within the state's implicit utility function—from a predominantly security-oriented asset toward a dual-use resource encompassing both strategic and economic dimensions.

Importantly, this paradigm shift did not remain at the level of macroeconomic rhetoric. It was rapidly translated into concrete legal and regulatory actions. The *Interim Regulations on the Administration of Unmanned Aircraft Flights* (State Council Decree No. 761), which came into force on January 1, 2024, established the first comprehensive legal framework for the commercial utilization of airspace below 1,000 meters. Prior to this regulation, China's rapidly expanding unmanned aerial vehicle (UAV) sector operated largely within a regulatory gray zone, where widespread "unauthorized flights" reflected not only enforcement challenges but also deep legal uncertainty. Such uncertainty significantly suppressed long-term capital formation and industrial investment. The new regulatory regime fundamentally altered this logic by shifting from a principle of general prohibition to a system of categorized and exception-based governance, thereby substantially reducing institutional transaction costs.

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The central analytical question of this study is therefore not whether the low-altitude economy possesses technological feasibility, but rather: *Why did this policy inflection occur in 2024?* The core enabling technologies underpinning low-altitude aviation—multi-rotor flight control systems, high-energy-density lithium batteries, and wireless communication links—had largely matured over the previous decade. DJI, for example, had already established global dominance in the consumer UAV market by the mid-2010s. This temporal mismatch suggests that the timing of China's airspace liberalization cannot be adequately explained by a sudden shock to technological supply.

Instead, this paper argues that the decisive drivers lie on the demand side of the macroeconomic system. In the post-pandemic period, China's growth model has been increasingly constrained by the diminishing marginal returns of land-based fiscal mechanisms and the tightening of local government debt ceilings. Against the backdrop of a pronounced contraction in real estate investment—declining by 10.6% in 2024—the state has faced mounting pressure to identify alternative sectors capable of absorbing capital, generating employment, and sustaining long-term growth momentum. Within this context, the low-altitude economy emerged as a rare policy option combining high capital intensity, strong technological spillovers, and scalable application scenarios.

The low-altitude economy is commonly defined as a comprehensive economic system driven by low-altitude flight activities involving both manned and unmanned aircraft. While its vertical operational scope is generally confined to airspace below 1,000 meters above ground level, pilot regions such as Hainan have extended this boundary to 3,000 meters. Crucially, it does not constitute a single industrial sector, but rather an integrated industrial ecosystem encompassing upstream research and manufacturing (advanced materials, avionics, batteries), midstream infrastructure and 保障 systems (communication, navigation, vertiports, air traffic management), and downstream application services (logistics, tourism, emergency response). According to estimates by the Civil Aviation Administration of China (CAAC), the sector reached an output scale of approximately RMB 500 billion in 2023, with official targets of RMB 1.5 trillion by 2025 and over RMB 3.5 trillion by 2035. These projections imply compound annual growth rates far exceeding those of traditional manufacturing or service industries, positioning the low-altitude economy as a pillar of China's modernization strategy over the coming decade.

This paper seeks to move beyond descriptive market assessments to interrogate the structural economic logic underlying the state's aggressive push toward airspace liberalization. We construct a *Policy Intensity Index* to examine the relationship between regulatory intervention and market expectations, and employ input–output analysis to decompose the multiplier effects associated with low-altitude economic activities. Most importantly, we advance and substantiate the *Sky Finance Hypothesis*, which posits that local governments are increasingly monetizing airspace resources through instruments such as concession rights and franchise auctions, thereby constructing a second fiscal reservoir to supplement the declining effectiveness of land-based finance.

2 Macroeconomic Context: Strategic Substitution from Land-Based to Airspace-Based Factors

To understand the explosive rise of the low-altitude economy in China's 2024 policy discourse, it is essential to situate this phenomenon within the broader macroeconomic transition from old to new growth drivers. Over the past three decades, China's economic expansion was largely underpinned by rapid urbanization and large-scale infrastructure investment. The financial foundation of this model was "land finance," whereby local governments generated substantial off-budget revenues through the transfer of land-use rights and subsequently leveraged these revenues via local government financing vehicles (LGFVs) to fund urban development. By 2023–2024, however, this growth regime encountered unprecedented structural constraints.

2.1 Structural Contraction of the Real Estate Sector and the Asset Vacuum

Macroeconomic data released by the National Bureau of Statistics (NBS) in 2024 reveal a pronounced deceleration of real estate as a core growth engine. National real estate development investment declined by 10.6% year-on-year in 2024, following a 9.6% contraction in 2023. More granular indicators point to even deeper stress: newly started construction area fell by nearly 23%, while sales of newly built commercial housing declined by 12.9%. These trends reflect not a cyclical downturn, but a process of structural deleveraging driven by demographic inflection, the maturation of urbanization into a stock-based phase, and sustained policy efforts to curb speculative real estate expansion.

The contraction of the property sector has far-reaching macroeconomic implications. Given the extraordinary

length of the real estate industrial chain, its downturn directly suppresses effective demand in upstream industries such as steel, cement, and construction machinery. More critically, it creates a fiscal vacuum for local governments. For years, land transfer revenues constituted a dominant share of subnational fiscal resources. As land markets cooled, local governments faced acute pressure to identify alternative asset classes capable of sustaining fiscal balance and preserving investment capacity in public infrastructure.

In response to this structural impasse, the central government explicitly emphasized the cultivation of "new quality productive forces" in the 2024 *Government Work Report*. This strategic orientation calls for a departure from energy-intensive, extensive growth models toward technology-intensive, high-value-added, and low-carbon development pathways. The low-altitude economy aligns closely with this mandate. It requires large-scale investment in new forms of infrastructure—such as general aviation airports, vertical takeoff and landing sites, and low-altitude intelligent networks—while simultaneously absorbing surplus capacity in strategic sectors including lithium batteries, fifth-generation (5G) communications, and carbon-fiber composite materials. Crucially, unlike real estate, these investments are less prone to speculative asset bubbles and systemic financial risk.

2.2 Policy Intensity Index and Hypothesis Testing

To empirically assess whether state attention toward the low-altitude economy experienced a structural break in 2024, this study introduces a *Policy Intensity Index* (PII). The index is constructed using text-mining techniques applied to central and provincial policy documents, capturing the frequency of key terms such as "low-altitude economy," "general aviation," and "unmanned aerial vehicles." These frequencies are weighted by document hierarchy (laws, administrative regulations, ministerial rules, and local legislation) and by the type of policy instruments employed (subsidies, planning directives, technical standards).

Quantitative analysis of policy texts from 2020 to 2024 reveals an exponential increase in the PII in 2024. Earlier policy references—such as those contained in the 2021 *National Comprehensive Three-Dimensional Transportation Network Planning Outline*—were largely indicative and programmatic in nature. By contrast, 2024 witnessed a convergence of top-level political endorsement, binding administrative regulation (State Council Decree No. 761), and the rapid rollout of concrete implementation measures and subsidy schemes across nearly thirty provinces and major cities, including Guangdong, Anhui, and Sichuan.

Figure 1 illustrates a strong correlation between policy intensity and market expectations. As policy supply steeply increased in 2024, projected market size curves for the low-altitude economy became markedly steeper. This synchronicity supports the central claim of this paper: the rapid expansion of the low-altitude economy is not the result of organic technological evolution alone, but rather the outcome of deliberate and forceful state intervention.

2.3 The Sky Finance Hypothesis: Fiscal Substitution in Practice

Building on this macroeconomic context, the paper advances a *Fiscal Substitution Hypothesis*: the intensity of low-altitude economic policies in a given region is negatively correlated with the fiscal health of its land-based revenue system. Regions with higher dependence on land finance and sharper declines in land transfer income exhibit stronger incentives to aggressively promote the assetization of airspace resources.

The transmission mechanism can be conceptualized as a transition between two fiscal circulation systems. The contracting "old cycle"—land transfer, real estate development, and fiscal revenue generation—has been progressively weakened. In parallel, an emerging "new cycle" is being constructed, centered on airspace rights clarification, infrastructure development, and the auction or concession of operational franchises. Through regulatory intervention—most notably the 2024 unmanned aircraft regulations—the state reduces reliance on the former cycle while removing institutional bottlenecks that previously constrained the latter.

A concrete example from November 2024 provides direct empirical support for this hypothesis. Pingyin County, Jinan City, Shandong Province, successfully auctioned a 30-year low-altitude economy concession right for RMB 924 million, with the winning bidder being a locally owned state enterprise, Shandong Jinyu General Aviation Co., Ltd. This transaction represents a milestone in fiscal innovation. It demonstrates that local governments have begun to treat low-altitude air routes as leaseable and capitalizable assets, replicating the financial logic long embedded in land-use right transfers. Rather than a conventional form of industrial support, this case exemplifies the emergence of "sky finance": by selling future airspace usage revenues in the form of long-term concessions, local governments obtain immediate fiscal liquidity to offset revenue shortfalls induced by the real estate downturn.

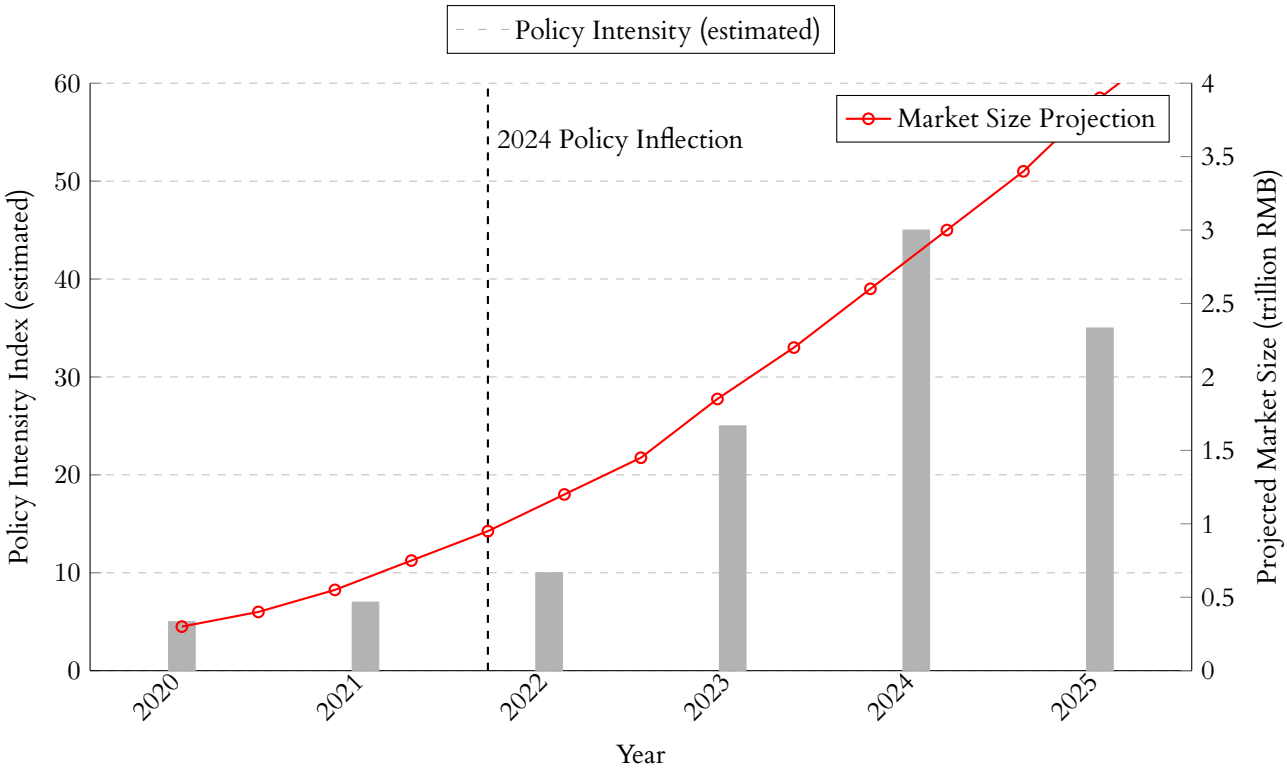

Figure 1: Policy Intensity and Market Size Expectations of China's Low-Altitude Economy

Notes: The Policy Intensity Index (left axis) aggregates central and provincial policy documents related to the low-altitude economy. The market size projection (right axis) follows estimates by the Civil Aviation Administration of China (CAAC) and related institutions. The dashed line highlights the 2024 policy inflection marked by the Government Work Report and State Council Decree No. 761.
Data sources: Swiss Re Institute; Xinhua (SCIO); State Council of China; ThinkChina; Gov.cn.

3 The Institutional Evolution of Airspace Liberalization: From Control to Governance

The evolution of China's low-altitude airspace management regime reflects a gradual but fundamental transition from an exclusive, military-dominated control paradigm toward a hybrid governance framework characterized by civil–military coordination, risk-based classification, and decentralized implementation. The regulatory breakthrough observed in 2024 did not emerge ex nihilo; rather, it represents a qualitative transformation built upon more than a decade of incremental institutional experimentation and policy learning.

Conceptually, this trajectory can be understood as a shift from *command-and-control regulation* toward *managed liberalization*, in which the state retains ultimate sovereignty over airspace while progressively redefining it as an allocable and governable economic resource.

3.1 The Ice-Breaking Phase (2010–2020): Tentative Reform under Security Dominance

The first formal attempt to reform China's low-altitude airspace management system dates back to 2010, when the State Council and the Central Military Commission jointly issued the *Opinions on Deepening the Reform of China's Low-Altitude Airspace Management*. This landmark document introduced, for the first time, a tripartite classification of low-altitude airspace into "reporting," "surveillance," and "controlled" zones, and articulated an ambitious objective to open airspace below 3,000 meters by 2020.

Despite its symbolic significance, implementation during this phase remained highly constrained. In practice, the absence of a unified technical infrastructure—particularly the lack of low-altitude surveillance systems, radar coverage, and digital communication networks—meant that the military continued to exercise de facto approval authority over most flight activities. As a result, "reporting zones" existed largely in name only, and general aviation operators continued to face severe administrative uncertainty and high transaction costs. Commercially viable low-altitude operations were thus structurally inhibited, and the sector remained marginal throughout the decade.

This phase is best characterized as an institutional "ice-breaking" period: reform objectives were articulated at the policy level, but the underlying governance capacity necessary to operationalize liberalization had not yet been

established.

3.2 Strategic Acceleration (2021–2023): Pilot Programs and De Facto Liberalization

A decisive shift occurred in 2021 with the release of the *National Comprehensive Three-Dimensional Transportation Network Planning Outline*, which explicitly incorporated the "low-altitude economy" into China's national transportation and industrial strategy. This marked a transition in policy orientation from merely *permitting* low-altitude flight to actively *promoting* it as an engine of economic growth.

During this period, several provinces—including Hunan, Hainan, and Sichuan—were approved as pilot regions for low-altitude airspace management reform. These jurisdictions began experimenting with province-wide airspace classification schemes, inter-agency coordination mechanisms, and localized regulatory sandboxes. Notably, Hunan emerged as the first province to implement comprehensive low-altitude airspace reform across its entire territory, while Hainan leveraged its island geography to test low-altitude tourism and logistics applications with relatively low systemic risk.

Simultaneously, technological and market dynamics began to outpace regulatory capacity. The explosive growth of consumer drones—dominated by firms such as DJI—created a de facto low-altitude flight ecosystem operating at massive scale. This proliferation of actual flight activity generated a powerful "regulatory backpressure" effect: rather than suppressing widespread unauthorized operations, regulators were increasingly compelled to shift from a strategy of obstruction to one of accommodation and risk management.

By the end of 2023, the coexistence of technological maturity, pilot-level institutional experience, and mounting enforcement challenges had rendered the pre-existing approval-centric regime untenable.

3.3 The 2024 Institutional Breakthrough: Legal Codification and Normalization

The implementation of the *Interim Regulations on the Management of Unmanned Aircraft Flight* (State Council Decree No. 761), effective January 1, 2024, constitutes a constitutional moment in the development of China's low-altitude economy. For the first time, low-altitude flight operations were comprehensively codified within a unified national legal framework.

The regulatory breakthrough manifests in three interrelated dimensions.

First, the regulations establish explicit and operationally meaningful standards for airspace classification. Airspace below 120 meters above ground level is designated as generally flyable airspace, within which micro and light unmanned aircraft may operate without prior approval except in restricted zones. This single provision dramatically lowered entry barriers for both consumer and light commercial drone operations, transforming low-altitude airspace from a de facto prohibited zone into a presumptively accessible resource.

Second, the regulations institutionalize a data-driven governance architecture through the launch of the Unified Unmanned Aircraft Management (UOM) platform. By integrating civil aviation, public security, and military data streams, the UOM system replaces discretionary, offline approval processes with standardized, digitalized supervision. This transition from "rule by personnel" to "rule by systems" significantly reduces regulatory opacity and enhances predictability for market participants.

Third, and most critically from a political economy perspective, the regulations explicitly assign responsibility for low-altitude infrastructure development—including takeoff and landing sites, communication networks, and monitoring facilities—to local governments at and above the county level. This legal clarification provides the institutional foundation for local governments to deploy special-purpose bonds and other financing instruments to construct "new low-altitude infrastructure," thereby aligning regulatory authority with fiscal incentives.

Taken together, these reforms signal the completion of a paradigm shift: low-altitude airspace is no longer governed solely as a security buffer, but as a managed economic commons subject to classification, pricing, and coordinated oversight. The 2024 regime thus marks the transition from episodic experimentation to the normalized governance of airspace as a factor of production.

4 Multiplier Effects and Industrial Linkages: The High-Efficiency Economic Logic of the Low-Altitude Economy

Why has the Chinese state selected the Low-Altitude Economy (LAE) as a strategic substitute for the real estate sector? The core economic rationale lies in its exceptionally high input–output multiplier. Drawing on Leontief'

s input–output framework, multiplier effects capture the extent to which a unit increase in final demand within a given sector generates cascading increases in total economic output through inter-industry linkages.

4.1 The "1:10" Input–Output Ratio: Empirical Origins and Structural Logic

Both academic studies and policy documents frequently cite a striking empirical estimate: the general aviation and low-altitude economy exhibit an input–output multiplier of approximately 1:10, alongside an employment multiplier close to 1:12. In practical terms, every additional yuan invested in the LAE is estimated to generate ten yuan of aggregate output across upstream and downstream industries, while each direct job creates roughly twelve indirect or induced employment opportunities.

This performance far exceeds that of traditional pillar sectors. By comparison, the automotive industry typically exhibits an input–output ratio of approximately 1:4, while the real estate sector—despite its massive scale—displays a multiplier closer to 1:3, largely concentrated in construction materials and low-skill labor absorption. These contrasts raise a critical analytical question: why does the LAE generate such disproportionate economic spillovers?

The answer lies in the sector's distinctive technological convergence and exceptionally strong backward industrial linkages.

4.1.1 Backward Linkages I: Advanced Materials

Unlike conventional commercial aircraft, which incorporate composite materials in roughly 50% of their airframe, electric vertical take-off and landing (eVTOL) aircraft pursue extreme thrust-to-weight optimization. As a result, carbon fiber reinforced polymers (CFRP) and other lightweight composites account for over 90% of structural components in many eVTOL designs.

This structural requirement directly stimulates high-end segments of China's materials industry. Domestic producers such as Jilin Chemical Fiber and Guangwei Composites benefit not from volume expansion alone, but from accelerated upgrading toward aerospace-grade composites, thereby raising value-added intensity across the supply chain. In this sense, the LAE functions as a demand-side catalyst for industrial upgrading rather than mere capacity absorption.

4.1.2 Backward Linkages II: New Energy and Battery Technologies

Energy storage constitutes the binding constraint of low-altitude flight. eVTOL platforms typically require gravimetric energy densities exceeding 400 Wh/kg, far surpassing the requirements of mainstream electric vehicles. This technological threshold positions the LAE as an ideal commercialization incubator for next-generation battery technologies, including semi-solid and solid-state batteries.

Leading firms such as CATL have explicitly identified aviation-grade batteries as a strategic frontier. The stringent safety and discharge-rate requirements of aerial applications force rapid technological iteration, generating spillover benefits that later diffuse into automotive, grid-scale storage, and defense-related energy systems. Consequently, the LAE amplifies the technological returns on China's existing dominance in the lithium-ion battery supply chain.

4.1.3 Backward Linkages III: Digital Infrastructure and the "Intelligent Sky"

Perhaps the most capital-intensive linkage emerges in digital infrastructure. High-density low-altitude operations cannot rely on traditional radar-based air traffic control systems. Instead, they necessitate the construction of an "Intelligent Low-Altitude Network" integrating 5G-A (5.5G) communication, joint communication-and-sensing (JCAS) base stations, high-precision BeiDou positioning, and millimeter-wave radar arrays.

These requirements provide a renewed capital expenditure rationale for state-owned telecommunications operators such as China Mobile and China Unicom, whose 5G investment cycles were approaching saturation. In effect, the LAE transforms the sky itself into an extension of the digital economy, enabling telecom infrastructure to function simultaneously as communication networks and spatial governance platforms.

4.2 Comparative Multiplier Analysis across Sectors

To clarify the relative capital efficiency of the Low-Altitude Economy, Table 1 compares estimated input–output multipliers across major sectors.

Table 1: Estimated Input–Output Multipliers across Key Sectors

Sector	Output Multiplier	Employment Multiplier
Real Estate	∼1:3	∼1:6
Automotive Manufacturing	∼1:4	∼1:8
High-Speed Rail	∼1:5	∼1:9
Low-Altitude Economy (GA / eVTOL / UAV)	∼1:10	∼1:12

The table highlights a crucial structural distinction. Whereas real estate relies heavily on low-complexity material inputs and one-off asset formation, the LAE combines infrastructure construction with continuous technological upgrading and recurrent service demand. This dynamic generates sustained inter-industry feedback loops rather than transient construction booms.

From a macroeconomic perspective, this explains why the LAE is uniquely suited to replace real estate as a growth engine. It absorbs capital at scale while simultaneously reinforcing China's strategic industries in advanced manufacturing, digital infrastructure, and energy systems. The multiplier effect of the LAE is therefore not merely quantitative, but qualitative: it reorients investment toward higher productivity and longer innovation cycles.

5 State Capacity, Regional Differentiation, and the Geography of Low-Altitude Growth

The expansion of China's Low-Altitude Economy does not follow a uniform national trajectory. Instead, it exhibits a deliberately differentiated spatial pattern that reflects both regional industrial endowments and the state's capacity for coordinated, multi-level governance. This section argues that China's ability to scale low-altitude development is rooted not in technological superiority alone, but in its capacity to orchestrate regionally specialized growth within a unified institutional framework.

5.1 From Fragmentation to Orchestrated Differentiation

Rather than pursuing a homogeneous rollout, the central government has implicitly adopted a functional differentiation strategy. Regions are encouraged to specialize according to comparative advantage, while remaining embedded within a nationally standardized regulatory and infrastructural system. This approach mitigates redundant investment, prevents local protectionism, and accelerates learning-by-doing across regions.

This spatial governance logic resembles a modified "flying geese" pattern, but with a crucial distinction: instead of sequential industrial upgrading driven by market forces, regional roles are assigned and reinforced through policy coordination, fiscal incentives, and state-led infrastructure deployment.

5.2 The Pearl River Delta: Manufacturing Density and Innovation Externalities

The Pearl River Delta (PRD), particularly Shenzhen and Zhuhai, functions as the manufacturing and innovation core of China's low-altitude ecosystem. Shenzhen's dominance in consumer and industrial drones—anchored by firms such as DJI—has produced the world's most complete UAV supply chain, spanning components, software, assembly, and testing.

In 2024, Shenzhen released its Low-Altitude Infrastructure High-Quality Development Plan (2024–2026), committing to the construction of over 1,000 vertiports. This "infrastructure-first" strategy is designed to induce demand by lowering entry barriers for operators. Dense physical nodes, coupled with digital airspace management systems, generate powerful network externalities: each additional vertiport increases the utility of the entire system, incentivizing logistics firms and urban air mobility providers to scale operations.

Here, state capacity manifests not through direct operational control, but through the preemptive provision of platform infrastructure that crowds in private activity.

5.3 The Yangtze River Delta: Capital Allocation and Institutional Integration

The Yangtze River Delta (YRD), led by Shanghai and Hefei, occupies a distinct functional niche centered on capital coordination, certification, and system integration. Hefei's well-documented "Hefei Model"—characterized by state-led equity investment in frontier industries—has been applied to eVTOL development through strategic

backing of firms such as EHang and the construction of the Luogang All-Space Unmanned Systems Demonstration Zone.

Shanghai, leveraging its position within China's civil aviation complex and proximity to COMAC, emphasizes airworthiness certification, aviation finance, and standards-setting. The region's focus is less on volume deployment and more on institutional legitimacy, ensuring that low-altitude technologies are compatible with national and international regulatory regimes.

This division of labor reduces systemic risk by separating rapid experimentation (in manufacturing hubs) from rule-making and financial validation (in institutional hubs).

5.4 Central and Western Regions: Application-Led Diffusion and Public Service Demand

In contrast, central and western provinces such as Sichuan and Hunan prioritize application-driven deployment. Mountainous terrain and sparse population density significantly increase the marginal cost of ground transportation infrastructure. In these regions, low-altitude systems offer immediate efficiency gains in public service delivery, including forest fire surveillance, power line inspection, agricultural spraying, and emergency medical logistics.

These use cases generate substantial positive externalities and social returns, strengthening political support for continued investment even in the absence of short-term commercial profitability. Crucially, they function as large-scale real-world testbeds, accelerating the maturation of operational standards and safety protocols under diverse environmental conditions.

5.5 State Capacity and Scalable Governance

The coexistence of differentiated regional strategies within a unified governance framework underscores a central feature of China's state capacity: the ability to combine decentralized experimentation with centralized coordination. Regulatory standards, data platforms, and fiscal instruments are harmonized nationally, while operational priorities are tailored locally.

This architecture allows China to scale the low-altitude economy not through market convergence alone, but through deliberate spatial orchestration. Growth emerges not from uniformity, but from managed heterogeneity—an approach that few other political economies possess the institutional capacity to replicate.

In this sense, the geography of low-altitude growth is not an incidental outcome of regional disparity, but a designed feature of China's development strategy.

6 Constraints, Risks, and the Political Economy of Low-Altitude Expansion

While the low-altitude economy has been strategically elevated as a new engine of growth, its large-scale deployment is neither frictionless nor risk-free. Treating low-altitude development as a functional substitute for real estate investment introduces a distinct set of economic, institutional, and social constraints. This section identifies three structural bottlenecks that may limit the sustainability of "sky-based growth": profitability gaps, governance complexity, and social acceptance risks.

6.1 The Profitability Gap: High Capital Intensity and Delayed Cash Flows

A central economic challenge facing low-altitude infrastructure lies in its capital-return profile. Similar to traditional infrastructure, low-altitude systems require substantial upfront investment in vertiports, communication-sensing integrated base stations, airspace management platforms, and safety assurance systems. However, unlike toll roads or power grids, demand for low-altitude services remains highly uncertain and application-dependent.

Most commercial use cases—urban air mobility, low-altitude tourism, and time-sensitive logistics—exhibit strong network effects but weak initial utilization. This results in a profitability gap between early-stage capital expenditure and long-term operational revenue. In practice, this gap is often bridged by local government subsidies, state-owned enterprise participation, or policy-backed credit guarantees.

The risk, however, is that if user adoption fails to scale as projected, local governments may face a new form of quasi-fiscal exposure, echoing earlier experiences with underutilized industrial parks or transport infrastructure. The transformation of airspace into a revenue-generating asset thus does not eliminate fiscal risk; it reshapes it temporally and institutionally.

6.2 Governance Complexity: From Airspace Control to System Governance

A second constraint arises from the governance demands of low-altitude systems. Unlike land-based infrastructure, low-altitude operations involve continuous real-time coordination across aviation authorities, public security agencies, local governments, and service operators. The shift from airspace control to airspace governance dramatically increases institutional complexity.

Although national platforms such as the Unified Unmanned Aircraft Management System (UOM) have improved coordination, practical implementation still varies widely across regions. Fragmented data standards, uneven enforcement capacity, and inconsistent emergency response protocols may undermine system reliability, particularly as traffic density increases.

This governance challenge intensifies as low-altitude systems move from pilot applications to routine urban operations. The marginal cost of failure rises non-linearly: a single high-profile accident can generate regulatory backlash, stall public acceptance, and impose abrupt policy reversals. In this sense, low-altitude governance exhibits characteristics of a "fragile equilibrium," where stability depends on continuous institutional learning rather than static regulatory design.

6.3 Social Acceptance and the Risk of Regulatory Reversal

Beyond economics and governance, social acceptance constitutes a third, often underestimated constraint. Low-altitude flight introduces new externalities—noise pollution, visual intrusion, privacy concerns, and perceived safety risks—that directly affect urban residents.

Unlike industrial infrastructure located in peripheral zones, low-altitude systems operate in close proximity to everyday life. Public tolerance, therefore, becomes a binding constraint. International experience suggests that local opposition can rapidly translate into regulatory tightening, regardless of national strategic priorities.

In China's case, strong administrative coordination may temporarily suppress localized resistance, but long-term legitimacy requires the internalization of social costs through compensation mechanisms, transparent data governance, and participatory planning processes. Failure to address these concerns risks triggering a cycle of public distrust and regulatory retrenchment, undermining investment confidence.

6.4 State Capacity as the Binding Variable

Taken together, these constraints suggest that the viability of the low-altitude economy is ultimately conditional on state capacity. Fiscal tools can absorb early-stage losses, regulatory coordination can manage system complexity, and political authority can mitigate social resistance—but only up to a point.

The low-altitude economy should therefore be understood not as a purely market-driven sector, nor as a simple extension of infrastructure investment, but as a governance-intensive domain where economic returns are inseparable from institutional performance. Regions with strong administrative coordination, credible fiscal frameworks, and adaptive regulatory institutions are more likely to sustain long-term growth, while weaker jurisdictions may face stagnation or reversal.

In this sense, low-altitude expansion is not merely a test of technology or capital, but a stress test of modern state capacity itself.

7 Conclusion and Theoretical Implications

This paper has examined China's acceleration of low-altitude airspace liberalization in 2024 not as a technology-driven inevitability, but as a deliberate macroeconomic and institutional response to the structural exhaustion of the land-based growth model. By situating the low-altitude economy within the broader context of supply-side structural reform, fiscal substitution, and state-led infrastructure expansion, the analysis demonstrates that airspace liberalization constitutes a strategic reconfiguration of factor allocation rather than a sectoral policy adjustment.

At its core, the low-altitude economy represents an attempt to transform airspace from a security-oriented administrative domain into an economically productive factor of production. This transformation parallels earlier land reforms that enabled the monetization of land-use rights, but differs fundamentally in its governance intensity, technological dependence, and risk profile. Whereas land-based development relied primarily on static property rights and one-off transactions, low-altitude development requires continuous system governance, real-time coordination, and sustained public legitimacy.

7.1 Reframing Low-Altitude Development as Fiscal and Institutional Substitution

The first theoretical contribution of this study lies in advancing the *Fiscal Substitution Hypothesis*. Empirical evidence from policy intensity analysis and local-level concession practices suggests that regions facing sharper declines in land-based fiscal revenues are more likely to aggressively promote the assetization of low-altitude airspace. In this sense, the low-altitude economy functions as a second-generation fiscal reservoir—what this paper terms "Sky Finance"—designed to replace declining land finance without replicating its speculative excesses.

This finding extends the literature on local government finance in China by identifying airspace infrastructure and concession rights as a new class of quasi-fiscal instruments. Rather than signaling a retreat from state-led investment, low-altitude development reflects the adaptive capacity of the Chinese state to reconfigure its revenue base under tightening debt constraints.

7.2 Multiplier Logic and the Political Economy of Infrastructure Choice

Second, the paper contributes to infrastructure economics by demonstrating why low-altitude systems possess unusually high input-output multipliers. Unlike traditional infrastructure that primarily stimulates construction demand, low-altitude infrastructure generates backward linkages across advanced materials, battery technologies, digital communications, and data services. This multi-sectoral convergence explains why low-altitude investment exhibits capital efficiency comparable to, and in some cases exceeding, that of legacy growth engines.

However, the analysis also cautions against treating multiplier effects as automatic or self-sustaining. High multipliers amplify both positive spillovers and systemic risks. Without sufficient demand realization and institutional coordination, the same mechanisms that generate rapid expansion can also produce underutilized assets and fiscal exposure.

7.3 State Capacity as the Binding Constraint

The most significant theoretical implication of this study is the identification of state capacity as the binding variable in low-altitude economic development. The viability of airspace monetization depends not only on technological readiness or capital availability, but on the state's ability to manage complex governance systems, internalize social externalities, and sustain regulatory credibility over time.

Low-altitude expansion therefore differs qualitatively from previous infrastructure-led growth strategies. It represents a shift from "building capacity" to "governing density," where marginal increases in traffic intensity disproportionately raise coordination costs and political risks. Regions with strong administrative coordination, digital governance capability, and credible fiscal institutions are more likely to succeed, while weaker jurisdictions may encounter stagnation or regulatory reversal.

7.4 Broader Implications and Future Research

Beyond China, this study offers a conceptual framework for analyzing how states respond to the exhaustion of traditional growth engines by redefining the economic status of previously non-market domains. Airspace, like data, spectrum, or environmental capacity, represents a frontier asset whose monetization requires high levels of institutional sophistication.

Future research could extend this framework through comparative analysis of low-altitude governance regimes across countries, or by empirically testing the long-term fiscal sustainability of sky-based revenue models. Micro-level studies on public acceptance, safety governance, and pricing mechanisms would further refine understanding of the conditions under which low-altitude economies transition from policy-driven expansion to market-based equilibrium.

In conclusion, the low-altitude economy should not be understood merely as an emerging industry, nor as a short-term stimulus tool. It is a structural experiment in reallocating spatial, fiscal, and institutional resources under conditions of slowing growth. Whether this experiment succeeds will depend less on how fast aircraft take off, and more on how effectively states learn to govern the skies they have opened.

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