

Impact of Growth in the Aviation Industry and Future Economic Prospects for China

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Abstract: *The aviation industry in China is playing an increasingly important role amidst economic transformation. This study incorporates forecasts from the Aviation Integrated Model (AIM) and simulations from the Aviation FAIR model, along with China's economic growth. Furthermore, it analyzes the costs and benefits and economic feasibility of alternative energy technologies for aviation, highlighting both the potential for mitigating impacts and the cost-related limitations associated with future growth.*

Keywords: *Aviation Industry Economic*

1. Introduction

The aviation industry in China plays an increasingly significant role in the economic (Wang et al., 2019), technological, and geopolitical dimensions. In the past decade, the Chinese government has designated aviation as a strategic industry in many regions (Badánik & Verhaar, 2024) under the policy of advanced industrial development and technological self-reliance (Tan, Dallas, Farrell, & Newman, 2025). Furthermore, this self-reliance has led to rapid growth in infrastructure investment, airport development, commercial aircraft manufacturing, and airline-network expansion (Misra, 2012).

Economically, China's aviation industry serves as a crucial mechanism for connecting large and geographically diverse domestic markets (Zhou, Li, & Deng, 2025), while simultaneously supporting international trade, tourism, and the movement of highly skilled labor. In addition, the growth of the middle class and the continuously increasing demand for air travel have propelled China to become one of the world's largest aviation markets (Zhang, 2019).

Technological dimension... China has accelerated the development of its aircraft design and manufacturing capabilities, such as the C919 commercial aircraft project, reflecting its efforts to reduce dependence on Western manufacturers (Zhao, 2024). Furthermore, China has prioritized building a comprehensive aviation industry ecosystem (Shusen & Gan, 2025), encompassing research and development, manufacturing, after-sales service, and air pollution control (Jia & Shen, 2025). These moves not only enhance China's competitiveness in the global market but also reflect a shift in the balance of power in the international aviation industry (Wübbecke et al., 2016).

Strategically, China's aviation industry plays a role linked to regional and global infrastructure development policies, such as the Belt and Road Initiative (BRI), which uses air transport as a key tool to expand international economic and political influence (Abeyaratne, 2024). Therefore, the aviation industry in China is not merely a transportation service sector. However, it is a structural element that reflects the direction of the country's development and China's role in the modern global economy (McIntyre and Hoadley, 2025).

Hillman and Ren (2024) stated that China's aviation industry serves as a key mechanism for driving economic and social development in many dimensions, especially its role in connecting diverse economic areas within the country, which are geographically as far away as Africa and have different levels of development (Pirie, 2020).

Jin and Majumdar (2025) stated that air transport systems help reduce the limitations of distance and time. The Chinese government promotes the movement of factors of production, tourism, and investment between economic hubs and secondary cities, which aligns with China's regional development strategies such as the development of special economic zones and the distribution of prosperity from the coast to the interior (Pongpat Jittanurak, Prasit Puthasatsattha, & Phra Palat Rapin Putthisaro, 2023).

At the macro level, China's aviation industry also serves as strategic infrastructure (Cui, Antunes, Wanke, Tan, Roubaud, & Jabbour, 2024). The Chinese government supports the growth of other industries such as tourism, logistics, international trade, and the digital economy (Zhang, Liu, Yao, & Fan, Z. (2022)). Furthermore, the Chinese government emphasizes the crucial role of air cargo transportation in modern supply chains, which require speed, precision, and high reliability (Xue & Zhu, 2024). Therefore, the aviation industry not only creates direct added value but also has a multiplier effect on the overall economy (Cui & Lei, 2023).

At the national strategic level, China's aviation industry is a key instrument in enhancing China's competitiveness and role in the global economy (Lee, 2018) through the expansion of its international aviation network and linkages with regional and international cooperation projects (Mai & Yan, 2023). Furthermore, the Belt and Road Initiative utilizes air transport as a channel to support trade, investment, and economic cooperation with its trading partners (Johnston, 2019). Therefore, China's aviation industry serves not only as a passenger and cargo transport system but also as a crucial structural mechanism for shaping economic development, distributing social opportunities, and strengthening the country's long-term economic and strategic power. If needed, I can provide a shorter link (Liao, Fang, Wang, & Liu, 2020).

Literature Related to the Chinese Aviation Industry

Numerous academic works indicate that China's aviation industry has developed rapidly and plays an increasingly significant role in the country's economy and infrastructure, especially after economic reforms and the opening of the country. Fu, Zhang, & Lei, (2012) The Chinese aviation industry has faced growth in the high-speed rail sector.

Heicks (2010) reported that Ang Xiaoping, Executive Vice President of the China National Aero-Technology Import & Export Corporation (CATIC), stated in Beijing on June 26, 1990, that a key objective for China's aviation industry in the coming decade was to shift from military to commercial production. He saw a massive global demand for commercial aircraft, which represented a major opportunity for China.

Wang, Yang, and Wang (2019) note that China's international air transport has experienced tremendous growth and undergone major reforms over the past two decades. While there has been extensive discussion about the development of China's domestic aviation market, the development of China's international aviation market has resulted from the process of deregulation in China's aviation market and the broad-reaching "open door" strategy on the global stage after 1990. Because China is located near East Asia and Southeast Asia, its international airline network displays clearly clustered patterns of short- and medium-haul travel in Asia. Moreover, the average distance of international air travel, institutional and policy changes, and increases in foreign trade and outbound tourism have all significantly expanded China's international aviation network.

Zhou, Ming, Zang, He, Luo, & Lan, (2017) The centralization of major airlines in China, such as Air China, China Eastern Airlines, and China Southern Airlines, has resulted in an oligopolistic structure within the industry. However, the growth of low-cost carriers and the launch of new routes between secondary cities have increased competition diversity and dynamics in recent years. (Zhang, & Ding, 2014).

Alternative Economy of China's Aviation Industry

Eaton (2013) describes the aviation industry of China as one of China's strategic sectors. Although currently the aviation industry is among the smaller industries characterized by state-owned enterprise monopolies, the initial stages of reform in the post-Mao era indicated a different future. In the early phase of reform, a decentralized approach to industrial development laid the foundation for an open market structure with relatively low levels of state intervention. Why did this gradual state withdrawal suddenly reverse in 1997? That year, regulators undertook bold downsizing measures, eventually leading to administrative restructuring of the industry centered on state airlines.

Goldstein (2006) asserts that the alternative economy of China's aviation industry refers to models of economic value creation that are not primarily dependent on passenger and freight transport revenues. The potential of China's industry to compete with Western aircraft manufacturers has long been underestimated, yet today this threat is now being taken much more seriously. The growth of China's air transport market has strengthened the bargaining power of domestic aircraft manufacturers, and the authorities are placing greater emphasis on building scientific and technological capacity in this area. Progress in military-civil integration has so far been rather limited, and overall the industry still lacks efficient coordination—yet it can leverage the resources, infrastructure, technology, and network of the aviation sector to develop new, flexible, sustainable economic activities aligned with the digital global economic context.

China has high potential to develop these alternative economic activities due to market size, state strength, and technological advancement. Technological progress is crucial for developing China's comparative advantage, since new and renewable energy technologies will benefit energy security. Technological advances that lead to environmentally friendly productivity and technological innovation are needed to improve industrial working conditions and productivity, as well as the types of technological innovation that can be supported—whether productivity-enhancing or environmentally-friendly technological advances—and how such progress will affect China's competitive advantage (Song & Wang, 2018).

In the knowledge-based economy era, the key driver of organizational performance is no longer traditional physical capital. Instead, the innovation- and technology-driven economy is increasingly important—one significant alternative economic axis is the development of the aviation industry as a base for advanced technological innovation. Here, the central capital is Intellectual Capital, which encompasses all of an organization's intangible assets, in the context of restructuring China's aviation industry to enhance indigenous innovation capability and ensure sustainable development in the future (Zhang, 2011).

Ongoing development of China's aviation industry includes artificial intelligence for aviation management, airport automation, big data analytics to optimize operations, and new aircraft development. Academic literature on the economics of innovation sees these activities as generating high added value and reducing reliance on direct travel revenues, while also promoting domestic human capital and intellectual property development (Lingrui & Xin, 2024).

Digital economy (Phongphat Et al 2023) and travel platforms: China's aviation industry can evolve into a platform economy. Shen, Li, and Li (2023) analyzed the influence not only of aviation but also of railways, roads, waterways, and civil aviation on the digital economy, using traffic information, urban data, and corporate data from the integrated transport system. They conducted regression analysis using the general spatial least squares method. As Shen (2023) pointed out, the promotion of the digital economy through transportation infrastructure is especially prominent in cities with a permanent population exceeding 3 million. Development of the digital economy and transport infrastructure is crucial for economic recovery and sustainable development.

Molchanova, Trushkina, and Katerna (2020) found that by integrating aviation services into digital systems, such as all-in-one travel platforms, countries with greater development adapt better to the rising role of digital platforms than those with limited resources and capabilities. Aviation, travel, and tourism industries are at the forefront of digital innovation, yet trends in the sector and in technology suggest further transformation is imminent. This sector is pioneering in adopting technology and digital platforms, but rising travel demand—driven by the burgeoning middle class in emerging markets and increased importance of digital experience—

signals that the shift to digital will be critical to meeting future consumer expectations.

Utilizing passenger data to offer personalized services, and linking to e-commerce, digital finance, and smart tourism—this kind of alternative economy transforms airlines and airports from “transportation providers” into “travel experience managers.” Kim and Cho (2025) stated that existing academic work on digital transformation in aviation has focused on improving logistics processes through systems and functions for each component of the logistics chain. Thus, their study offers recommendations for successfully applying digital transformation in aviation, by identifying industry trends amid widespread digital change, analyzing the varied forms of adoption, and offering directions for value creation and innovative development in the aviation sector’s future.

When it comes to digital systems and platforms, a critical missing piece is green economy and sustainable aviation—a highly promising alternative economic model. Sustainability literature indicates that the aviation industry can be a testbed for environmental policy and stewardship, including sustainable aviation fuel (SAF), low-carbon airports, and smart energy management. For China, development of a green aviation economy not only addresses environmental targets but also creates new business opportunities in the clean energy supply chain and environmental technology.

Ficca, Marulo, and Sollo (2023) have written that environmentally friendly and sustainable aviation can be achieved through continual improvements on multiple fronts simultaneously—including ramping up sustainable aviation fuel (SAF) production and breakthrough technology. This will demand research, testing, and potentially many setbacks before achieving the transport efficiency and operational safety standard of conventional propulsion systems. Nevertheless, these drawbacks should motivate scientists, engineers, politicians, and visionaries to seriously strive for truly new forms of green aviation.

Ficca (2023) also noted that decarbonizing the aviation industry requires a strategic shift from short-term improvements in aircraft fuel efficiency to long-term fuel transitions (from neutrality to zero-carbon emissions). The successful adoption of long-term solutions necessitates interdisciplinary research on technology, operations, and economics. New technologies should be used first with small aircraft, then scaled up to larger planes as technology matures. We should expect to see the first all-electric and hydrogen fuel cell passenger planes enter service by the end of this decade, and hydrogen-combustion narrowbody aircraft to begin operating around 2040.

Fundamental Theories of Industrial Economics and Sustainable Development in China’s Aviation Industry

Berthélemy & Demurger (2000). Industrial economics theory provides a key conceptual framework for explaining the structure, conduct, and performance of industries (Structure–Conduct–Performance: SCP) (Tan & Wang, 2017), which is particularly well suited for analyzing China’s aviation industry, characterized by state-supervised growth, limited competition, and large-scale infrastructure investment. The literature indicates that China’s aviation industry cannot be explained solely by free market mechanisms, but must also consider the role of the state and industrial policy in parallel. Industrial economics indicators used to analyze China’s aviation industry (Zhao, Wu, & Wang, 2022): Market Concentration: CR4 and HHI Market concentration is a key concept in industrial economics theory, used to explain the competitive structure and market power of operators within an industry. The most commonly used indicators are the Concentration Ratio (CR4) and the Herfindahl–Hirschman Index (HHI), which help reflect whether the market exhibits free competition, monopoly, or oligopoly characteristics. For China’s aviation industry, these indicators are especially important, as the market is dominated by large state-owned airlines and is closely regulated by the government.

Concentration Ratio (CR4)

CR4 is the combined share of the four largest companies in the market, used to assess the level of market dominance held by the main players.

$$CR4 = S_1 + S_2 + S_3 + S_4$$

where S_i is the market share of operator i ; general interpretation

CR4 < 40% → highly competitive market

CR4 = 40–60% → semi-competitive market

CR4 > 60% → oligopolistic/monopolistic market dominated by major players
In the context of China's aviation industry, the CR4 value typically reflects the leading role of the main airlines, namely Air China, China Eastern Airlines, China Southern Airlines, and Hainan Airlines.

Herfindahl–Hirschman Index (HHI)

HHI is an index that takes into account all firms in the market by taking the market share of each firm, squaring it, and then summing the results. This allows it to reflect market power imbalances more effectively than CR4.

$$HHI = \sum_{i=1}^n S_i^2$$

(by percentage)

General interpretation

HHI < 1,500 → Highly competitive market

HHI = 1,500–2,500 → Moderately concentrated market

HHI > 2,500 → Highly concentrated market / Near-monopoly

Therefore, HHI is suitable for analyzing the Chinese aviation market, where, despite the presence of numerous airlines, market shares are concentrated among the major carriers

Application to China's aviation industry

Market structure Most research finds that China's aviation industry exhibits an oligopoly market structure, with a relatively high CR4, reflecting that a few major operators hold the majority of the market share. Meanwhile, the HHI is at a moderate to high level, indicating a concentration of market power. Although smaller airlines and low-cost carriers have increased competition, in the Chinese context, the role of the state is significant. The CR4 and HHI do not reflect only economic competition, but also the government's regulatory structure, which plays a role in route allocation, price control, and mergers to maintain industry stability. These indicators are thus used to analyze both economic efficiency and policy objectives. Linkage with performance under the Structure–Conduct–Performance (SCP) framework The high degree of market concentration in China's aviation industry is associated with mild price competition, an emphasis on service quality and route networks, and financial stability of the main airlines. At the same time, it may also limit incentives to improve efficiency and innovate during certain periods.

Study Results

Future Growth Trends of China's Aviation Industry

China's aviation industry is undergoing a structural and strategic transition, shifting from a market focused primarily on network expansion toward growth driven by innovation, technology, and sustainability. As a result of the relaxation of COVID-19 measures, government policies supporting large-scale infrastructure, and the expansion of the middle class, the medium- to long-term outlook for the industry is characterized by several clear trends. Growth in passenger volume and flights following the post-COVID-19 recovery: Air travel in China is expected to rebound quickly, with: Passenger volume anticipated to return to pre-COVID levels and continue sustained growth over the long term as both domestic and international travel demand rises. Daily flights and route frequencies will expand on both major and secondary routes. Increasing capacity at medium- and small-sized airports will enhance connectivity between secondary and primary cities. This growth is supported by the rise of China's middle class and economic expansion in areas outside major cities. Fleet and international route expansion: China plans to increase the number of aircraft, both in commercial aviation and air cargo, reflecting the following trends: The fleet is projected to more than double within the next two decades to accommodate both passenger and cargo demand. The recovery of international routes is restoring China's critical role in the global aviation network. The trend toward opening new routes in Asia–Europe–America will further strengthen competitiveness between Chinese and international airlines.

Technology development and Smart Aviation: The shift toward digitalization and advanced technology will play a vital role as follows: Advanced Air Traffic Management improves safety and flight capacity. AI and Big Data will be used for passenger behavior analysis, resource allocation, and operational optimization. The development of passenger information systems and in-flight and airport digital services. This trend reflects a phenomenon where China's aviation industry is not only increasing in volume but also enhancing service quality and passenger experience.

Growth in cargo aviation: The digital logistics economy drives the expansion of air cargo. The volume of goods and parcels transported by air will increase, especially in the cross-border e-commerce sector. China will become one of the world's largest air cargo markets. The integration of cargo hubs will reinforce global supply chain expansion capacity.

Sustainable development and the green economy: Future trends must align with environmental goals, such as: The use of Sustainable Aviation Fuel (SAF) to promote lower carbon emissions. The development of Green Airports with clean energy standards. The implementation of intelligent energy management systems to reduce greenhouse gas emissions. Sustainability research suggests that the future aviation industry must integrate growth with environmental impact mitigation to align with ESG objectives and China's national vision.

International competition and strategic strategy: China is likely to: Strengthen its role in connecting international aviation networks and serve as a pivotal hub for regional aviation. Develop partnerships with countries along the Belt and Road Initiative. Utilize aviation infrastructure as a mechanism supporting international trade and economic growth. This distinguishes China from other domestic aviation markets, owing to the links between economics and geopolitical-level policies.

Development of China's Aviation Industry in the Context of Structural Transition

China's aviation industry is facing a structural transformation from quantitative to quality-oriented growth, including technological upgrading, service improvement, expanding logistics roles, integration with the digital economy, sustainable development, and serving as a national and regional strategic mechanism. Contemporary literature indicates that these developments are not isolated but interconnected within an integrated aviation ecosystem.

Technological and Service Upgrading: Technological advancement forms the core of long-term aviation industry development in China, particularly the application of digital technologies such as Artificial Intelligence (AI), Big Data analytics, and automation in aviation operations, air traffic management, and airport administration. These technologies enhance efficiency, reduce costs, and improve safety. In terms of service, Chinese airlines are shifting from being transport providers to experience-oriented service providers through personalized service design, digital platforms, and integrated services across the journey chain. This upgrade reflects a shift from price-based to value- and quality-based competition.

Growth of Air Cargo and Logistics: Air cargo has become a key growth driver for China's aviation industry, fueled by e-commerce expansion, cross-border logistics, and global supply chains. Logistics economics literature views air cargo not just as a trade support activity but as a strategic infrastructure linking the domestic economy to the global market. China is likely to develop cargo hubs and dedicated cargo fleets, which help diversify risks from volatility in the passenger market and increase overall industry resilience.

Integration with the Digital Economy: Integrating the aviation industry with the digital economy is a significant trend reshaping value creation in the aviation sector. Chinese airlines and airports are developing digital platforms that connect travel, payments, tourism, and other ancillary services. Platform economics literature points out that using passenger data as a strategic resource enhances ancillary revenue generation and customer loyalty. Aviation is thus becoming part of the digital economy system, rather than a standalone sector.

Sustainable Aviation Development: Under environmental pressures and carbon commitments, China's aviation industry is moving toward sustainable development, emphasizing reductions in greenhouse gas emissions, the adoption of Sustainable Aviation Fuel (SAF), and the development of green airports. Sustainability literature suggests that environmental investment in aviation is not merely a cost, but a long-term competitive advantage. Sustainable development also enhances the industry's image and legitimacy for China's aviation sector on the international stage.

National and Regional Strategic Role: China's aviation industry serves as a strategic mechanism supporting national and regional economic development. Aviation infrastructure connects major and secondary cities, reduces spatial inequality, and supports regional economic development. Internationally, China's aviation

network is part of strategies for economic and trade connectivity. Aviation thus acts as “infrastructure of power,” linking economic, policy, and geopolitical factors.

Discussion of Results: The Development of China's Aviation Economy

The study's findings indicate that China's aviation economy is transitioning from a growth model primarily reliant on expanding passenger volumes and infrastructure investment toward quality-driven growth, propelled by technology, innovation, and integration with the broader economy. This transition reflects the role of the aviation economy as a key engine of national and regional economic development, rather than merely a transportation sector.

First, upgrades in technology and production efficiency within the aviation sector have enhanced the overall productivity of the aviation economy. The adoption of digital systems, artificial intelligence, and data management has led to reduced unit costs, while improving service quality and safety standards. These results are consistent with industrial economics theories highlighting technological innovation as a critical factor in boosting long-term industrial efficiency and competitiveness.

Second, the expansion of air cargo transport has strengthened the aviation economy's role in the global value chain. Air cargo is no longer just a trade support activity, but has become a strategic infrastructure connecting manufacturing, e-commerce, and cross-border logistics sectors. The study reveals that the growth in air cargo helps increase the aviation economy's resilience, reducing vulnerability to fluctuations in the passenger market.

Third, the integration of the aviation economy with the digital economy has transformed value creation models and the revenue structure for operators, shifting reliance from fare-based revenue to generating income from platforms, ancillary services, and leveraging data as a strategic resource. This shift reflects the emergence of a platform-based aviation economy, aligning with the literature on digital and platform economics.

Fourth, the dimension of sustainable development plays a crucial role in shaping the direction of China's aviation economy. Although measures to reduce carbon emissions and investments in green technologies raise short-term costs, in the long term, they enhance the competitiveness, credibility, and legitimacy of China's aviation economy on the international stage. This issue aligns with the sustainable development framework, which views economic growth as inseparable from environmental and social responsibility.

Finally, China's aviation economy serves as a strategic mechanism supporting spatial development and regional connectivity. Aviation infrastructure helps lower transportation costs, increases market access, and stimulates investment across various regions—underscoring the role of the aviation economy as “infrastructural power,” linking together economics, policy, and geopolitics.

The Future of China's Aviation Economic Development

Looking ahead, China's aviation economy is expected to evolve toward a more integrated, resilient, and sustainable system. Growth will no longer be measured solely by passenger numbers or flight frequency, but by the ability to generate added value, deploy advanced technology, and achieve efficient integration with other economic sectors. Key trends include the expansion of logistics and air cargo operations, the development of digital travel platforms, investment in green technologies, and the use of the aviation economy as an instrument to support national and regional development strategies. These trends will help boost China's competitiveness in an increasingly uncertain global economic system.

2. Conclusion

In summary, the development of China's aviation economy reflects a transformation from quantity-driven to quality-driven growth, led by innovation, technology, and sustainability. The aviation economy is thus not merely a transport sector, but a strategic economic system that plays a vital role in the country's long-term economic development, society, and competitiveness.

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