# Research on the Characteristics and Development Modes of Financial Demand in Airport - related Economy Based on QCA

Yunchun Cao, Yu Zhang*

Civil Aviation University of China, Tianjin, 300300, China

2093326048@qq.com

**Abstract.** With the rapid development of the logistics industry and the continuous expansion of the scale of airports, the airport economy, as an emerging industrial development mode different from the economy centered on the airport and the aviation economy, is playing a crucial role in the economic development around the airport. In order to carry out research on the impact of financial demands at different development stages on the airport economy and its own development rules and patterns this article takes the Zhengzhou Airport Economic Zone as an example applies the QCA multi - agent fuzzy decision - making method establishes a systematic and scientific index evaluation system and constructs a financial development model from the perspective of airport economy This provides a reference for the financial industry layout and the evaluation system of the financial development model of other airport economic zones across the country.

**Keywords:** Air Transportation; Airport - related Economy; Financial Demand

## 1 Introduction

With the rapid development of China's national economy, the airport economy has become one of the important emerging industrial forms. On the afternoon of February 23, 2024, General Secretary Xi Jinping stressed at the fourth meeting of the Central Financial and Economic Commission that we should coordinate the logistics hubs, optimize the construction of the transportation infrastructure and the layout of the major productive forces, vigorously develop the airport economy and the port economy, and raise the airport economy to the national strategic level. Local governments are actively responding and are making every effort to develop the airport economy.

Zhengzhou Airport Economic Comprehensive Experimental Zone which is the only national pilot for aviation economy development approved by the State Council, and also a pilot area of the Zhengzhou - Luxembourg "Air Silk Road", plays a leading role in the development of airport economy in our country. However, in the actual development, this area is confronted with problems such as great construction difficulties and a shortage of funds. Therefore, the in - depth analysis of Zhengzhou Airport Economy


K. Othman et al. (eds.), *Proceedings of the 2026 5th International Conference on Mathematical Statistics and Economic Analysis (MSEA 2026)*, Advances in Economics, Business and Management Research 402,
https://doi.org/10.2991/978-94-6239-774-3_5

Comprehensive Experimental Zone in this paper can not only contribute to promoting the development of this area but also offer references for the development of other airport economy demonstration zones in China.

## 2 Literature Review

### 2.1 The Connotation of the Airport Economy

Regarding the research on the airport economy in China, it can be traced back to Professor Cao Yunchun's early related work [1]. The airport economy, which is a new - type regional economic form, refers to the process of attracting related production factors like capital, information, technology, and population to gather around the airport by making use of the airport's infrastructure and resources, relying on aviation transportation activities or the aviation manufacturing industry, and depending on the airport's industrial agglomeration effect, thereby forming an industrial cluster around the airport with different degrees of aviation connection [1]. The airport economy, which is an economic development pattern that takes air transportation as the foundation and engages in global logistics and passenger flow, is a kind of entity. As a new economic form that relies on air hubs, it rather demonstrates such remarkable characteristics as being highly agglomerative, having high technology and high added value, and being strongly time-sensitive. Moreover, as a multi-functional economic zone, the airport economic zone plays a crucial role in promoting the development of the regional economy.

### 2.2 Development Models of the Airport Economy

At present, the research regarding airport economy mainly focuses on aspects like the formation mechanism, the development mechanism, and the coordinated development. Regarding the aspect of development mechanisms, the research by Yang Xiao in 2016 on the impact of the Zhengzhou Airport Economy Comprehensive Experimental Zone on the economic development of Henan was conducted. This research analyses the factors that drive the regional economic development in the airport area and their mechanisms, and also puts forward policy suggestions with the aim of providing references for the coordination between the construction of the airport area and the economic development of Henan, as well as providing practical guidance for the government and enterprises. Based on the airport economic theory and the regional economic development theory, by using methods such as grey relational analysis, this research has identified the key factors that influence the economic development of Henan. It puts forward the countermeasures which focus on infrastructure, logistics information, human resources, and value-added services, in order to cultivate the coordinated development between the airport area and the regional economy. In 2021, Zhang Yixuan, by virtue of the symbiosis theory, delved deeply into the development mechanism of airport economic zones. It carried out an analysis of three aspects, namely the interaction of symbiotic units, the evolution of symbiotic models, and the role of symbiotic interfaces as a medium. Then, a model of the development mechanism of airport economic zones was constructed. In the research, it is found that the symbiotic relationships, symbiotic

capabilities, and symbiotic interfaces mediated by innovation capabilities in these regions will promote the coordinated development of various industries. The symbiotic effect that is produced by these elements which on the whole drives the airport economic zone to move forward towards achieving its development goals as per [2].

Regarding the formation mechanism, the reasons for the preferential policies of the aviation industry in the central and western regions of China have been theoretically explored by Yan Xiangwu in 2022. Empirical research is carried out by using the spatial Durbin model and the synthetic control method. It is discovered that although the preferential policies have raised the cargo and mail throughput of the airport, they have also made the competition among the aviation hubs in the central and western regions more acute, causing the economic development of the airport to move in the direction of regional competition, which has a detrimental impact on the economy. The research also proposes optimizing the policies, for example, enhancing the economic tournament system, unifying the fuel prices, establishing regional coordination mechanisms, distinguishing the key points of subsidies, etc., in order to optimize the environment for the economic development of the airport and promote the transformation of the Chinese economy in the direction of "slowing down the growth rate and improving the quality". Sun Xiaoxi (2024) takes the Zhengzhou Airport Economic Zone as a typical case to conduct research, in order to explore new development opportunities, and identifies five driving forces for promoting the airport economy which are industrial agglomeration, industrial division of labor, technological innovation, government support, and market orientation, each of which contributes to the creation of a dynamic model [3].

In terms of coordinated development, Wang Mengzhou (2023), through constructing an index system and model analysis, explores the association status, the coordinated development situation, and the influencing factors of the air cargo logistics of Zhengzhou Airport Economic Zone and the regional economies of various cities in Henan. This study has discovered that the Zhengzhou Airport Economic Zone clearly drives the economy of the surrounding cities, yet there are differences in regional development. The main obstacles have changed from the value of goods and the environment, and so on, to the scale of goods, value, as well as social consumption ability, and so forth. Qiu Hao (2024) made use of the SFIC model, regarding "starting situation, catalytic leadership, institutional design, and collaborative process" as the four elements as an analysis framework, systematically exploring the coordinated development of the Hangzhou - Shaoxing airport economy from an overall perspective, trying to find out the internal pattern, and offering theoretical and practical guidance for the continuous progress of airport economy.

As an emerging economic form, the airport economy is seldom associated with scholars and their financial needs by them. At present, under the current situation of in - depth research on China's airport economy, there are still relatively few theoretical and empirical analyses of the financial demands and development models of the airport economy from a regional perspective. Therefore, this paper selects the Zhengzhou Airport Economic Zone as the research object and also uses the QCA multi - agent fuzzy decision - making to study the financial demands and development models of each stage of the airport economy. A thorough analysis and research on this issue will be beneficial

to promoting the high-quality development of China's airport economy and can also point out the future direction for its sustainable development.

# 3 Development Stages and Financial Characteristics of Airport Economy

## 3.1 Development Stages of Airport Economy

According to the life cycle theory, the development of the airport economy can be roughly divided into three stages, namely the initial stage, the development stage, and the mature stage.

In the initial stage, it was due to the timeliness of air transportation, and then enterprises preferring the airport carried out a gathering around the airport. During this period, the key lies in developing core aviation industries such as air transportation and air logistics, and all of these are concentrated within the airport operation area. There are large amounts of land around the airport that remain idle and undeveloped. The second phase is the developmental phase. Driven by the effects of industrial agglomeration and the demand for resource acquisition, the upstream and downstream industries within the aviation industry chain then start their development accordingly. The continuous improvement of the airport's infrastructure, the expansion of the route network, the increase in the number of airlines, and the emergence and formation of industrial parks as industrial clusters result in the scope of land use being extended from the airport operation area to the surrounding areas. The third stage is the mature stage. At this moment, the agglomeration and development of the relevant industries at the airport have become rather complete, and the airport has turned into an international transportation hub with a fairly good development of intermodal transport, thus forming a large - scale transportation network. Industries are continuously upgrading towards the high-end, and R & D innovative enterprises, the financial sector, as well as the modern service industry, become key development areas. Production factors such as human resources, materials, capital, and transportation capacity are expanding towards cities and their hinterlands, driving the rapid development of the regional economy.

At present, the Zhengzhou Airport Economy Comprehensive Experimental Zone (ZAEZ) that takes the airport as the core and adopts the mode of expanding on both wings to form three major functional layouts, has basically constructed an urban spatial structure of "one core leading three areas, two corridors connecting three centers, and two axes connecting three rings". It also has an industrial layout that includes the core airport area, the urban comprehensive service area, the airport adjacent commercial exhibition and transaction area, and the high-end manufacturing agglomeration area. From the spatial structure and industrial cluster characteristics of Zhengzhou Airport Economic Zone, it can be roughly judged that this area is currently in the development stage of airport economy.

### 3.2 Financial Demand Characteristics in Different Development Stages of Airport Economy

The financial demands and characteristics in different development stages of the airport economy are shown in Table 1.

**Table 1.** Correspondence Between Financial Demands and Various Development Stages of Airport Economy.

| Development Stage of Airport Economy | Capital Demand Orientation | Investment Subject | Financial Demand Characteristics | Development Type of Financial Demand |
|---|---|---|---|---|
| Initial Stage | Land acquisition and utilization<br>Airport construction<br>Airline entry, etc. | Government | Large demand volume<br>Long cycle | Government-Driven Type |
| Development Stage | Infrastructure improvement and expansion<br>Living security<br>Financial formats, settlement, etc. | Market | High capital liquidity<br>High management efficiency<br>Cost-conscious | Market-Led Type |

In the initial stage of airport economy, key activities such as land requisition and utilization, airport construction, airline entry, and the establishment of core aviation enterprises oriented to the airport all need to involve a large amount of funds. The basic financial services within the region need to be well - safeguarded, and the funds mainly depend on government investment and bank loans to support the infrastructure and the initial - stage development of enterprises. At the same time, a corresponding financial service system should be developed so as to meet the needs of local enterprises and individuals. Owing to the airport having rather high external benefits, having public welfare attributes, incurring high construction costs, and the aviation - related industries having lagging effects, the government thus becomes the main driving force. Then so what, this stage of financial needs has been formed into a type that is driven by the government, then.

In the development stage of the airport economy that is full of various demands like infrastructure to be upgraded, residents' living facilities to be guaranteed, and aviation finance forms to enter, for example. Like air logistics finance, financial leasing, and the like, technological finance also supports the high-end manufacturing industry, as well as the new requirements brought about by the continuously improving aviation industry chain, enterprise agglomeration, and the like. With the support policies of aviation finance, finance will then exert its own regulating function, guiding funds to the high - value - added industries related to airports. With the airport scale effect becoming more pronounced and the cargo throughput continuously increasing, as well as enterprises clustering in large numbers, all of which cause the market regulation function to be stronger, then the financial demand is of the market - led type.

In the mature stage of the airport's economy, the airport economic zone becomes a growth pole of the regional economy, and then, for instance, it needs continuous innovation of financial products to meet the high-level requirements of the enterprises that

have moved in. For example, there are aspects such as risk reduction in the aviation field, as well as investment management, and so forth. It focuses on international development along with green and sustainable elements like green aviation and circular economy, as well as intelligent improvements such as information technology - driven city management and well - formed financial systems. As a municipal financial center, it strongly radiates in a way that it emits radiation to the surrounding areas. The financial demand that is oriented towards the type of financial investment is defined because the financial investment entities have changed from the government (initial stage) and the market (development stage) to the financial institutions.

# 4 Empirical Analysis of the Development Path of Financial Demand in ZAEZ Based on the QCA Method

## 4.1 Current Development Status of Financial Demand in ZAEZ

Centered around its five strategic directions and five core functional centers, ZAEZ focuses on ten key industries and has initially formed a “4 plus 3 plus 3” industrial system which covers advanced manufacturing, strategic emerging industries, and modern service industries, and has multiple industrial clusters established. Meanwhile, this area has already accomplished the “1 plus 1 plus 7” port system construction, which provides the crucial support for the import and export of products. In the policy framework aspect, a series of supportive policies issued by the central and local governments are to promote the high-quality development of fields like the airport economy and the financial industry.

## 4.2 Construction of Evaluation Indicators

**Table 2.** Literature Review on the Influencing Factors of Financial Demand.

| Time | Researchers | Research Indicators |
|---|---|---|
| 2010 | Button K, Doh S, Yuan J [4] | Industry, institutional mechanisms, land, taxation, port platforms, etc. |
| 2015 | Florida R, Mellander C, Holgersson T [5] | Passenger throughput, cargo throughput, regional GDP, fixed asset investment, industrial development, development environment and systems, regional effects, etc. |
| 2018 | Bilotkach V [7] | Spatial layout, industrial layout, infrastructure planning |
| 2019 | YANG Dafeng [8] | Policies, financial funds, investment and financing platforms, and leasing business |
| 2020 | Gibbons S, Wu W [9], Wang D, Zhao X, Shen L [14] | Banking industry, trust industry, investment and financing platforms, insurance industry, securities industry |
| 2023 | Raimundo R J, Baltazar M E, Cruz S P [11] | Navigable cities, industries, enterprises, talents, etc. |
| 2022 | Pot F J, Koster S [10] | Passenger traffic, cargo traffic, aircraft takeoffs and landings, and total loans of financial institutions in the hinterland |
| 2024 | ZHOU Zhengming, ZHENG Xinru, ZHOU Shupeng [12] | Technology, industry, policy |
| 2025 | Pi J, Liu X, Qiang W W [6], Sartzetaki M, Karampini T, Karagkouni A [13] | Economy, institutions, talents, etc. |

Based on the in - depth research on the airport economic development stages and financial demand characteristics in Chapter Two, together with the relevant literature in this area (as shown in Table 2), and the research results of Zheng Yuxiao and others. In this paper, through detailed data collection and sorting of the ZAEZ, a comprehensive evaluation index system of financial needs is constructed. This system not only takes into account the multi-dimensional factors that affect the economic development of the airport but also integrates the actual availability of data, thereby refining and expanding the original index system.

This paper, which takes financial needs as the outcome variable for selection, comprehensively analyzes the three dimensions of production, development, and innovation.

When constructing the economic development support index system of the airport economic zone, its gross regional product (which is GRP, namely the total value) is a core index that directly reflects the economic scale and overall strength, while the fixed asset investment (that is the fixed one) is included to evaluate the development potential and impetus—its scale, growth rate, and structure can demonstrate the development trend and industrial optimization situation. Together, they have actually laid the foundation for policy making and investment decision making.

As the core carriers of airport economy, the cargo and mail throughput (cargo volume) of airports, the number of cities with flights (number of cities), and the number of airline companies (number of airline companies) are the key production indicators that reflect passenger/cargo transportation capacity, and are the core measurement means that are supported by infrastructure.

The core function of government agencies lies in the policy guidance (policies) that provide directions for industrial agglomeration, infrastructure, and innovation, as well as in the credit regulation (credits) that creates a favorable business environment by standardizing the market order.

The number of enterprises, which can be seen as a key indicator of the development level of the park, reflects industrial agglomeration, economic vitality, and competitiveness.

Regarding the industrial development (industry), two key indicators are used to measure it: one is the growth rate of the value added of large-scale industry (the speed, which reflects the vitality of the industry), and the other is the proportion of the tertiary industry (the ratio, which indicates the economic structure).

Through the arrangement of ZAEZ data, ten conditional variables are derived—the gross domestic product (total), the fixed asset investment (fixed), the cargo and mail throughput (cargo), the number of open cities (city), the airline (airlines), the policy guidance (policy-related), the credit regulation (credit-related), the number of enterprises (number of enterprises), the growth rate of value added of large-scale industries (rate-related), and the proportion of the tertiary industry (proportion-related), as well as one result variable (financial demand). Based on these circumstances, a certain assessment system that caters to the financial requirements of the ZAEZ has been developed (as shown in Table 3).

**Table 3.** Establishment of All Indicators in the Financial Demand Evaluation System.

| Variable | Primary Indicator | Secondary Indicators |
|---|---|---|
| Outcome variable | Financial demand | production |
| | | development |
| | | innovation |
| Condition Variable | support | gross |
| | | fixed |
| | infrastructure | cargo |
| | | city |
| | | airlines |
| | government | policy |
| | | credit |
| | corporation | number |
| | industry | speed |
| | | proportion |

## 4.3 Variable Calibration

Since the result variables and condition variables involved in this study are all continuous variables, the direct method is adopted to carry out the numerical calibration. This method first needs researchers to set a value of an equidistant scale according to specific characteristics or actual rules, and then construct a fuzzy set standard for calibration through three qualitative demarcation points, which are the intersection point, the complete membership, and the complete non-membership.

According to the actual situation of current scientific research and social practice, the 50th percentile of the conditional variable's value is taken as the standard for the intersection point, while the 95th percentile and the 5th percentile are respectively used as the anchoring standards for "complete members" and "complete non-members". The detailed explanation of the calibration rules is in Table 4.

**Table 4.** Calibration Rules for Conditional Variables and Outcome Variables.

| Variable Type | Research Variables | Full Membership | Crossover Point | Full Non-Membership |
|---|---|---|---|---|
| Condition Variable | gross | 37555 | 33760.5 | 31020.75 |
| | fixed | 628.8315 | 590.4565 | 553.87775 |
| | cargo | 688415.025 | 573337.55 | 505766.75 |
| | city | 164.25 | 120.5 | 89.5 |
| | airlines | 91 | 83.5 | 72.25 |
| | policy | 12.25 | 9 | 4.25 |
| | credit | 2.75 | 1 | 0.25 |
| | number | 37555 | 33760.5 | 31020.75 |
| | speed | 9.75 | 6.45 | 4.825 |
| | proportion | 0.5935 | 0.588 | 0.53425 |
| Outcome variable | Financial demand | 648.25 | 517 | 110.25 |

This research is specifically aimed at the sets which have a membership degree of 0. Then 0.001 is added to each value within these sets. This method can not only simplify the processing procedure but also can effectively avoid the analysis interference caused by that zero and the like. Tables 5 and 6 present the calibration results of the outcome variable and the condition variable.

**Table 5.** Calibrated Results.

| year | Financial demand | gross | fixed | cargo | city | airlines |
|---|---|---|---|---|---|---|
| 2022 | 0.52 | 0.17 | 0.02 | 0.16 | 0.79 | 0.04 |
| 2021 | 0.49 | 0.09 | 0.59 | 0.09 | 0.97 | 0.27 |
| 2020 | 0.91 | 0.76 | 0.97 | 0.77 | 0.85 | 0.09 |
| 2019 | 0.04 | 0.95 | 0.85 | 0.95 | 0.09 | 0.96 |
| 2018 | 0.96 | 0.95 | 0.41 | 0.95 | 0.07 | 0.92 |
| 2017 | 0.11 | 0.04 | 0.34 | 0.04 | 0.04 | 0.67 |

**Table 6.** Calibrated Results.

| year | policy | credit | number | speed | proportion |
|---|---|---|---|---|---|
| 2022 | 0.35 | 0.85 | 0.17 | 0.77 | 0.47 |
| 2021 | 0.02 | 0.501 | 0.09 | 0.58 | 0.96 |
| 2020 | 0.72 | 0.501 | 0.76 | 0.34 | 0.9 |
| 2019 | 0.98 | 0.97 | 0.95 | 0.34 | 0.75 |
| 2018 | 0.35 | 0.501 | 0.95 | 0.97 | 0.09 |
| 2017 | 0.72 | 0.02 | 0.04 | 0.02 | 0.04 |

### 4.4 Single-Factor Necessity Analysis

The core of QCA is in exploring the interwoven influences of multiple factors behind a phenomenon from a configurational perspective, but before delving into these configurational conditions, a detailed analysis needs to be carried out first, specifically, the necessity of each individual factor needs to be evaluated. Through the operation of the fsQCA software, the necessity analysis results of the high financial demand are shown in Table 7, and the necessity analysis results of the low financial demand are presented in Table 8.

**Table 7.** Necessity Test for High Financial Demand.

| Condition Variable | Consistency | Coverage |
|---|---|---|
| gross | 0.676568 | 0.692568 |
| ~gross | 0.478548 | 0.476974 |
| fixed | 0.653465 | 0.622642 |
| ~fixed | 0.561056 | 0.602837 |
| cargo | 0.663366 | 0.715303 |

| | | |
|---|---|---|
| ~cargo | 0.485148 | 0.460815 |
| city | 0.485149 | 0.498305 |
| ~city | 0.709571 | 0.704918 |
| airlines | 0.636964 | 0.632787 |
| ~airlines | 0.485148 | 0.498305 |
| policy | 0.524752 | 0.506369 |
| ~policy | 0.683168 | 0.723776 |
| credit | 0.683828 | 0.619803 |
| ~credit | 0.586799 | 0.669176 |
| number | 0.676568 | 0.692568 |
| ~number | 0.478548 | 0.476974 |
| speed | 0.782178 | 0.784768 |
| ~speed | 0.491749 | 0.500000 |
| proportion | 0.669967 | 0.632399 |
| ~proportion | 0.567657 | 0.616488 |

**Table 8.** Necessity Test for Low Financial Demand.

| Condition Variable | Consistency | Coverage |
|---|---|---|
| gross | 0.464646 | 0.466216 |
| ~gross | 0.693603 | 0.677632 |
| fixed | 0.622896 | 0.581761 |
| ~fixed | 0.595960 | 0.627659 |
| cargo | 0.420875 | 0.444840 |
| ~cargo | 0.730640 | 0.680251 |
| city | 0.696970 | 0.701695 |
| ~city | 0.501683 | 0.488525 |
| airlines | 0.501684 | 0.488525 |
| ~airlines | 0.622896 | 0.627119 |
| policy | 0.734007 | 0.694268 |
| ~policy | 0.478114 | 0.494268 |
| credit | 0.704040 | 0.625486 |
| ~credit | 0.572054 | 0.639443 |
| number | 0.464646 | 0.466216 |
| ~number | 0.693603 | 0.677632 |
| speed | 0.498317 | 0.490066 |
| ~speed | 0.781145 | 0.778523 |
| proportion | 0.639731 | 0.591900 |
| ~proportion | 0.602694 | 0.641577 |

### 4.5 Construction of Truth Tables

When exploring the development paths of high financial demands, this research has incorporated ten conditional variables. A consistency threshold of 0.8 is set, and then truth tables are constructed for the development of high - financial - demand and low - financial - demand as shown in Tables 9, 10, 11, and 12.

**Table 9.** Truth Table for High-Level Outcome Variable.

| gross | fixed | cargo | city | airlines | policy |
|---|---|---|---|---|---|
| 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 1 |

**Table 10.** Truth Table for High-Level Outcome Variable Results.

| credit | number | speed | proportion | Financial de-mand | raw consist |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 | 0.987074 |
| 1 | 0 | 1 | 0 | 1 | 0.985507 |
| 1 | 1 | 0 | 1 | 0 | 0.261905 |
| 0 | 0 | 0 | 0 | 0 | 0.312500 |

**Table 11.** Truth Table for Low-Level Outcome Variable.

| gross | fixed | cargo | city | airlines | policy |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 0 |

**Table 12.** Truth Table for Low-Level Outcome Variable Results.

| credit | number | speed | proportion | ~ Financial demand | raw consist |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 | 0.811986 |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 0 | 1 | 0 | 1 | 0.913044 |
| 1 | 1 | 0 | 1 | 0 | 0.348653 |
| 1 | 1 | 1 | 0 | 0 | 0.269414 |

### 4.6 Multi-Factor Configurational Analysis

After the truth table is constructed and analyzed, the software simplifies the path types via Boolean algebra operations, thereby yielding the structural analysis results. QCA configuration analysis consists of specific analysis and standard analysis. As for the standard analysis, it includes the remaining part of logic and also employs counterfactual hypotheses to judge the result, so it is a kind of method that is regarded as being able to generate reliable results.

In the standard analysis, three types of solutions are worked out: the complicated solution, the intermediate solution, and the simple solution. What makes them different lies in whether counterfactual assumptions are applied and the ease of application. The results of this study are presented in the form of intermediate solutions, while the parsimonious solutions are used to indicate whether conditional variables play a core role in outcome variables.

**Types of High Financial Demand Development in Zhengzhou Airport Economy Zone.**

Through the analysis of the results gained from the fsQCA software and the combinations of different condition variables, the combinations of condition variables for the development of high financial demand in Zhengzhou Airport Economic Zone are shown in Table 13.

**Table 13.** Configurational Analysis Results for Achieving the Target.

| Condition Variable | Antecedent Condition Combinations | | | |
|---|---|---|---|---|
| | S1 | S2 | S3 | S4 |
| gross | ⊗ | ● | ⊗ | ● |
| fixed | ⊗ | ⊗ | • | • |
| cargo | ● | ⊗ | ● | ● |
| city | ⊗ | • | ⊗ | ⊗ |
| airlines | ● | ⊗ | ● | ● |
| policy | ⊗ | ⊗ | ⊗ | • |
| credit | ● | ● | ● | ● |
| number | ⊗ | ● | ⊗ | ● |
| speed | ● | ● | ● | ⊗ |
| proportion | ⊗ | ⊗ | • | • |
| Raw Coverage | 0.224422 | 0.208251 | 0.277228 | 0.208251 |
| Unique Coverage | 0.161716 | 0.148845 | 0.148515 | 0.0927392 |

| | | | | |
|---|---|---|---|---|
| Consistency | 0.985507 | 1 | 0.987074 | 1 |
| Overall Coverage | 0.683828 | | | |
| Overall Consistency | 0.989967 | | | |

Note: ●indicates a high degree of the condition, indicates a low degree; large circles represent core conditions, and small circles represent peripheral conditions; blank spaces indicate that the condition has no impact on the outcome in the path combination. The same applies below.

In the configuration analysis result table, there are the original coverage which is the proportion of the number of cases in a specific condition combination to the total number of result cases and the unique coverage which is the proportion of the number of cases in that combination after excluding the overlapping parts with other paths to the total number of result cases. The higher the values of both are, the greater the possibility that the causal condition combination leads to the result; however, they are not the main analysis indicators in QCA. Consistency, which is an indicator used to measure the reliability of the combination of condition variables to achieve the corresponding result variables, is a core analytical basis in QCA.

From the results in the above table, it can be seen that there are 4 kinds of combined conditional variables for the development of the high - financial - demand in Zhengzhou Airport Economy Zone. The lowest consistency value is 0.985507, and the overall consistency is surprisingly as high as 0. The value of 989967 has indeed exceeded the preset theoretical threshold. This research, this indicates that the results of structural analysis are fairly convincing. The combination of these 4 kinds of condition variables can be regarded as a sufficient condition for the Zhengzhou Airport Economic Zone to achieve the development with high financial demands. Meanwhile, the overall coverage rate is 0. More than 68% of the annual data observed in this research can be explained by these 4 combinations, and this is what 683828 represents. The following are the combinations of 4 condition variables presented in the result:

*Path S1.*

(~gross~fixedcargo~cityairlines~policycredit~numberspeed*~proportion): This path shows that the key factors for the development of high financial demand in Zhengzhou Airport Area are the relatively low fixed asset investment, the large quantity of goods throughput, the small number of civil aviation cities, the large number of airline companies, the weak policy guidance, the strong credit supervision, the rapid growth rate of the value added of industries above a designated size as well as the balanced proportion of the tertiary industry. The original coverage of this path is 0.22422, and this accounts for 22% of the cases in this study. Infrastructure support, the government, and various industries all play a core role in this development path.

*Path S2.*

(gross~fixed~cargocity~airlines~policycreditnumberspeed*~proportion): This path shows that the large regional GDP in the airport area, the lower fixed - asset investment, the weaker policy guidance, the stronger credit regulation, the large number of enterprises, the rapid growth rate of the value - added of industries above a certain size, and the balanced proportion of the tertiary industry can promote the rapid development of

the high - financial - demand in the Zhengzhou Airport Economic Zone. Its original coverage rate is 0.208251, and it actually accounts for 21% of the cases. Supports in economic development, the government, relevant enterprises, and various industries, which act as the core indicators of this path, offer important support for the development with high financial requirements in the Zhengzhou Airport Economic Zone.

*Path S3.*

(~grossfixedcargo~cityairlines~policycredit~numberspeed*proportion): Similar to path S1, this path removes the proportions of fixed assets and the tertiary industry, regarding them as core factors that influence the result variable. The original coverage rate is 0.277228 which constitutes 28% of the case situations. Infrastructure support and the like, in the development process of this road, are rather important factors. Infrastructure supports, as well as government-related aspects, are quite important elements in the course of the development of this road.

*Path S4.*

(grossfixedcargo~cityairlinespolicycreditnumber~speed*proportion): This path shows that the huge regional GDP in the airport area, the large quantity of freight throughput, the small number of cities with open-to-traffic, the numerous airlines, the strong credit supervision, as well as the large number of enterprises, are the breakthrough points for the Zhengzhou Airport Economic Zone to realize the development with high financial demands. Its original coverage ratio is 0.208251, and it can account for 21 percent of the cases. Under this approach, the infrastructure support and the relevant enterprises that are the key elements for the high financial demand development of Zhengzhou Airport Economy Zone can be said to be.

**Types of Low Financial Demand Development in Zhengzhou Airport Economy Zone.**

The combination of conditional variables that result in low financial demand, which is regarded as the result variable in standard analysis, is shown in Table 14. It turns out that there are 4 such combinations of conditional variables. Moreover, the overall consistency of this solution is basically the same as the preset threshold of 0. Just having the content of “8, and the overall coverage rate is 0” is rather unclear about how to specifically rewrite it. You can further supplement relevant background information or clarify the specific requirements. That is to say, the above 4 types of combinations can represent more than 81% of the low financial demand instances within this particular research. Through summarizing and analyzing the configuration results of the target, the causes of low financial demand can be roughly classified into the following two types:

The small gross domestic product in the airport area reflects the weak foundation of the economic development of the said region. The small quantity of cargo throughput results in insufficient freight volume in the airline operation, and the large number of cities which are open to aviation, combined with the small number of airlines, causes the low efficiency of the airline operation, which shows that the infrastructure support

in this area is insufficient. Although the policy guidance is relatively strong, the aforementioned factors still hinder the development of the financial demand in the Zhengzhou Airport Economic Zone. This path corresponds to the initial development stage of Zhengzhou Airport Economic Zone, at which time various functions are rather incomplete and the development level is quite low.

The decrease in the small regional GDP in the airport area has weakened its attraction to enterprises, thereby causing the economic scale not to meet the demands for financial enterprises to enter, and then resulting in low financial demand. Both paths, S2 and S3, display this characteristic. Owing to the impact of the epidemic, the reduction of personnel mobility as well as the decrease of enterprise output causes the regional economic development not to reach the expected level, thereby resulting in sluggish financial demand. It is quite obvious that there is a very strong positive correlation between the gross domestic product of the airport area and the financial requirements. The region's economic situation has a considerable impact on its financial requirements and the economic development that can, to a certain extent, determine the level of financial demand in that region.

**Table 14.** Configurational Analysis Results for Achieving ~Target.

| Condition Variable | Antecedent Condition Combinations | | | |
|---|---|---|---|---|
| | S1 | S2 | S3 | S4 |
| gross | ⊗ | ⊗ | ⊗ | • |
| fixed | ⊗ | ⊗ | • | • |
| cargo | ⊗ | • | • | ⊗ |
| city | ● | ⊗ | ⊗ | ● |
| airlines | ⊗ | • | • | ⊗ |
| policy | ● | ⊗ | ⊗ | ● |
| credit | ⊗ | • | • | • |
| number | ⊗ | ⊗ | ⊗ | • |
| speed | ⊗ | • | • | ⊗ |
| proportion | ⊗ | ⊗ | • | • |
| Raw Coverage | 0.26936 | 0.212121 | 0.23266 | 0.282828 |
| Unique Coverage | 0.215488 | 0.151515 | 0.155219 | 0.212121 |
| Consistency | 1 | 0.913044 | 0.811986 | 1 |
| Overall Coverage | 0.818519 | | | |
| Overall Consistency | 0.920485 | | | |

## 4.7 Summary of Financial Demand Development Paths in Zhengzhou Airport Economy Zone

In the process of urban development, the financial demands and the closely interrelated development patterns exist. The high capital requirement has a connection with the new urban development mode, for example, promoting urban construction through large -

scale demolition and construction. This mode which puts speed in the first place, rapidly creates the upgrade of the urban landscape through large - scale demolition and new - building projects. Within a short time, the urban infrastructure and the construction scale are expanding rapidly, with a large number of tall buildings emerging, new urban areas being quickly formed, and the urban boundaries being rapidly extended.

The low financial needs are usually in line with an organic growth pattern of the cities, which is also a traditional urbanization pattern. It places emphasis on the orderly development of the economy and society, focusing on gradually accumulating and optimizing on the existing basis. Under this mode, the urban development is just like the growth of a biological organism - a process that is gradual and sustainable. Through reasonable planning and guidance, the existing resources are fully utilized, and the functions and qualities of various cities are gradually enhanced.

Just as the above - mentioned study has indicated, the results of this study are summarized in Table 15. From the summary table, it can be observed that in the process of the development of Zhengzhou Airport Economy Zone, there are various means to increase financial demands, and there are also quite a number of key factors that impede the development of its financial demands. This has important reference significance for China's practical work of enhancing financial demands in each stage of airport economic development.

**Table 15.** Summary Table of Research Results.

| Outcome Variable | Path Type | Corresponding Type & Period | Financial Demand Development Stage |
|---|---|---|---|
| High Financial Demand (Target) | S1, S3 | Government-Driven Type | Initial Stage |
| | S2 | Early Market-Led Type | Early Development Stage |
| | S4 | Mid-to-Late Market-Led Type | Mid-to-Late Development Stage |
| Low Financial Demand (~Target) | S1, S4 | Government-Driven Type | Initial Stage |
| | S2, S3 | Market-Led Type | Development Stage |

A comprehensive summation is carried out on the path rules for achieving the high - financial - demand in the Zhengzhou Airport Economic Zone. Based on the above - mentioned four types of conditional variable combinations that realize high financial demands, this research further summarizes the path rules of the development of high financial demands in Zhengzhou Airport Economy Comprehensive Experimental Zone:

**Government-Driven Type (Paths S1 and S3).**

In the paths S1 and S3, the growth rates of cargo throughput, the number of navigable cities, the number of airlines, policy guidance, credit supervision, and the value-added of large-scale industries are the indispensable necessary conditions for the Zhengzhou Airport Economic Zone to attain high financial demands. With these conditions, both

paths present different characteristics: the improved infrastructure construction provides a solid guarantee, the strong government support offers a powerful backing, and the balanced industrial development injects strong impetus—these characteristics together form an important driving force for high financial demand. Therefore, these two paths are uniformly categorized as "government-driven". Clearly, these characteristics are highly in line with the development characteristics in the early stage of the airport's economy which fully indicates that the airport plays a leading role in the development of the airport's economy. The government's promotion of infrastructure development and introduction of the aviation - priority industries is mainly for the purpose of rapidly injecting funds in the early stage, isn't it? The path S1 corresponds to the formation period of the early development stage, while the path S3 refers to the post - formation period of the early stage when the large - scale infrastructure construction is basically completed. Because of the relevance of their key factors, they are classified into one category. During this phase, which also corresponds to the initial stage of financial demand, the government investment, which is the main one at this time, and more enterprises should be encouraged to participate in the initial construction and development of the airport economic zone.

**Early Stage of Market-Led Type (Path S2).**

Within the path S2, the supports in economic development, the government, the relevant enterprises, and various industries are the core conditions driving the development of high financial demand, so this path is summarized as the "early stage of the market - leading type". The local economy that plays a crucial role and has a low dependence on the cargo throughput and the number of airlines represents the initial stage of the airport's economic development. At this moment, the airport economy is more influenced by the radiation of the urban economy and is relatively lowly dependent on the aviation industry itself. Correspondingly, this phase coincides with the early stage of the development period of financial needs. At the present stage, the financial demands have shifted from the large-scale infrastructure aspects to meeting the actual demands of the enterprises. Private investment enterprises should be the main force, and with government investment as a supplement, which can increase the number of airlines and enterprises, accelerate the growth rate of industrial added value above a certain scale, and inject impetus into the stable development of the airport economic zone.

**Mid-to-Late Stage of Market-Led Type (Path S4).**

In the path S4, the infrastructure support and the related enterprises which have become the main sources of high financial demands, are the ones that are then classified into the "mid-to-late stage of the market - led type". At this moment, enterprises are in a stage of rapid growth, having strong demands for capital and vigorous financial needs. With the development of airport economy enterprises related to aviation have thrived both in quantity and scale, gradually replacing the relatively scattered industrial structure in the early days and becoming a core driving force for regional economic devel-

opment. At this moment, the airport shows a busy scene with a large quantity of passengers moving about and a fair number of airline companies; the large-scale infrastructure construction has basically been finished, and various functions are becoming more and more perfect. This indicates that this area is generally in the middle to late stage of the airport economic development, and in this stage, the market forces that are in charge of the economic development, as well as the formation of the financial demands. Although there is still a certain degree of dependence on the local economy, the dependence on the supporting function of the airport infrastructure has increased significantly. On the one hand, the airport economy can now realize its own functions and offer services for the urban economy; on the other hand, it better supports the growth of airport cargo throughput and the rise in the number of airlines, thereby promoting the development of the airport. Correspondingly, this stage is in line with the middle to later periods of the development of financial needs. As the number of enterprises keeps on increasing, the airport economic industry chain keeps on being optimized, and the industrial agglomeration gradually becomes perfect, there emerges an ever-growing demand for financial products and service innovation. Along with the development of the financial market, the financial regulatory system continuously becomes stricter and more perfect, which creates an increasingly optimized business environment for the financial industry and effectively promotes the development of finance.

**Predicted Financial Investment-Driven Type (Mature Stage).**

Given that the Zhengzhou Airport Economic Zone is still in the process of development and has not reached the mature stage of the airport economy, when analyzing its financial demand development path, there is not at all any completely suitable path model. However, as time passes and the airport economic zone is continuously constructed and improved, when it develops into a regional economic growth pole, it is expected to attract numerous financial investment institutions. In this process, the airport economic zone is likely to gradually develop into a regional financial center. At that moment, the financial investment structure will be dominated by financial investment institutions, and then supplemented by government investments and private investment enterprises, thereby creating a diversified and relatively complete financial investment pattern.

An analysis of the situation of the low financial demand development in Zhengzhou Airport Economy Comprehensive Experimental Zone shows that the key factors resulting in the low financial demand in the initial stage are: the small total regional GDP of the airport area, the small cargo throughput, the large number of cities open to civil aviation, the small number of airline companies, the strong policy guidance, the small number of enterprises, and the slow growth rate of the added value of large - scale industrial enterprises. At present, the key factors leading to the relatively low financial demand are the non-large regional GDP of the airport area and the relatively small number of enterprises. Under specific conditions, there is a positive correlation between the regional GDP and the financial demand in the airport area. The development of financial demand is divided into three stages, each having different key points of capital demand: “government-driven” stands for the initial stage of airport economic development, with the key point of capital demand being the government, corresponding to the

initial stage of financial demand; "market-led" covers the early - to - mid - stages and the mid - to - late - stages of airport economic development, with the key point of capital demand being enterprises, corresponding to the development stage of financial demand; the expected "financial investment - driven" will represent the mature stage of airport economic development, with the key point of capital demand being financial institutions, corresponding to the mature stage of financial demand.

## 5 Development Countermeasures and Suggestions

At this point, private investment enterprises are mainly in the lead regarding financial demand for investment. Based on the characteristics and demands of financial demands at each stage, this research puts forward the following countermeasures and suggestions for the development of financial demands in Zhengzhou Airport Economic Zone:

### 5.1 Initial Stage of Financial Demand

Establishing policy foundations: There should be the creation of exclusive supportive policies, like implementing tax reductions and exemptions for new financial institutions, and also the establishment of guiding funds to attract social capital to support key financial projects. Introducing and nurturing financial institutions: providing venues and decoration subsidies to traditional financial institutions, encouraging the establishment of local micro-loan institutions, and offering risk compensation. Primarily constructing a credit system: establishing an enterprise credit information database, perfecting a personal credit collection mechanism, thereby reducing credit risks and promoting the initial development of the financial industry.

### 5.2 Early Stage of the Development Period of Financial Demand

To optimize the financial policy environment, one should learn from the experiences of the financially developed regions, upgrade the development policies of the financial industry, and also strengthen publicity and so forth. To promote the agglomeration of financial institutions, tax incentives are provided so as to attract well-known financial institutions, and local financial institutions are supported in expanding their businesses. For innovating financial service models, the development of supply chain finance is carried out so as to alleviate the financing difficulties of small and medium-sized enterprises, and the "finance + technological innovation" model is advanced so as to serve innovative regions, thus laying a foundation for financial development.

### 5.3 Mid-to-Late Stage of the Development Period of Financial Demand

The strengthening of financial infrastructure construction: A comprehensive financial service platform is developed, relying on big data, cloud computing, and blockchain technologies. For the purpose of promoting the effective docking of capital projects, regular industry financial docking meetings, project roadshows, theme forums, and

other activities are held, and banks, securities companies, insurance companies, investment institutions, and the like are organized. To participate in meeting the needs of enterprises of different industries and at different development stages so as to enhance the efficiency and accuracy of financial services, won't you? Implementing a financial talent strategy: combining local training with the introduction of high - end talents to provide intellectual support for industrial development. To strengthen financial regulation and risk prevention: in line with the trends of financial innovation and mixed operation, the supervision mode is promoted to transform from institutional supervision to functional supervision and conduct supervision. A risk prevention framework that combines macro-prudential management and micro-prudential supervision is constructed, and the monitoring, assessment, and early warning of systemic financial risks are strengthened. Regarding the improvement of laws and regulations for safeguarding the rights and interests of financial consumers, the responsibilities and obligations of financial institutions in aspects like information disclosure, appropriateness management, and dispute resolution will be clearly defined. In order to ensure the stable operation of the financial market and finally to promote good financial development, so as to better serve the real economy.

### 5.4 Mature Stage of Financial Demand

To strengthen international financial cooperation, we should proceed with expanding cross-border financial services and participating in the formulation of international rules. For optimizing financial regulation and risk prevention, we need to construct a modern regulatory system to guard against systemic risks. To construct a highland for financial talents, the training system is improved, and the introduction of talents is strengthened, thereby comprehensively promoting the financial field to develop towards a higher level. By analyzing each stage of the financial demand development in Zhengzhou Airport Economy Zone, it can be seen that different development stages have different financial characteristics and demands, and the financial model needs to be closely matched with the development path. In the later stage of the development of the financial needs, the above - mentioned series of measures will promote the development of the financial industry, laying a foundation for moving towards the mature stage of the financial needs. The various stages complement each other, jointly promoting the high - quality development of the airport economy.

## 6 Limitations and Future Outlook

There are two key limitations in this research. One is that the data, which focuses on the ZAEZ, is insufficient, and the cross - regional comparison is also limited and the time series is short; the other is that the index system is incomplete, it overemphasizes the explicit factors, ignores the implicit factors, and the qualitative or single - dimensional index restricts the validity of the conclusion. Please provide the complete content for the future research direction: 1. as required, so that I can rewrite it according to the

rules. Enrich cross - regional, long - time - series as well as enterprise micro-data; supplement implicit factor indices and multi - dimensional quantification methods; 3. (the content behind is missing, and it is retained as it is). Through advanced models like panel data and machine learning, international cases are integrated so as to explore the integration situation of the airport economy, digital and green finance, thereby providing theoretical support for policy - making.

## 7 Conclusion

This paper takes Zhengzhou Airport Economic Comprehensive Experimental Zone as the research object, empirically analyzes the influencing factors and realization paths of its financial demand development based on the QCA method, and combines the urban development model and the characteristics of the airport economic development stage to sort out the core research conclusions. It provides theoretical support and practical reference for the cultivation of financial demand in the airport economic zone and the high-quality development of regional economy. The research clarifies the three core paths of the development of Zhengzhou Airport 's high financial demand, namely, ' government-driven ', ' market-oriented early stage ', and ' market-oriented middle and late stage ', and predicts that the future will evolve into a mature path of ' financial investment type '. Different paths correspond to the differentiated development stage of airport economy and financial demand. The main body and focus of capital demand gradually change with the stage, which conforms to the development law of airport economy from start to maturity.

## References

1. CAO Yunchun. Analysis of Key Elements, Modes and Evolution Mechanism of Airport Economy Development. Urban Insight, 2013, 13(2): 5-16. DOI: 10.3969/j.issn.1674-7178.2013.02.001.
2. ZHANG Yixuan. Research on the Development Mechanism and Model Construction of Airport Economic Zones Based on Symbiosis Theory. Journal of Henan University (Social Science Edition), 2021, 61(6): 33-38.DOI: 10.15991/j.cnki.411028.2021.06.005.
3. SUN Xiaoxi. Research on the Dynamic Mechanism of Airport Economy Development—Taking Zhengzhou Airport Economy Zone as an Example. China Management Informationization, 2024, 27(17): 165-168. DOI: 10.3969/j.issn.1673-0194.2024.17.050.
4. Button K, Doh S, Yuan J. The role of small airports in economic development. Journal of Airport Management, 2010, 4(2): 125-136. DOI:10.69554/zbai1323.
5. Florida R, Mellander C, Holgersson T. Up in the air: the role of airports for regional economic development. The annals of regional science, 2015, 54(1): 197-214. DOI: https://doi.org/10.1007/s00168-014-0651-z.
6. Pi J, Liu X, Qiang W W, et al. The impacts of airport economic zones on local urban development in China. Journal of Air Transport Management, 2025, 129: 102875. DOI: 10.1016/j.jairtraman.2025.102875.

7. Bilotkach V. Political economy of infrastructure investment: Evidence from the economic stimulus airport grants. Economics of Transportation, 2018, 13: 27-35. DOI: 10.1016/j.ecotra.2017.12.003.
8. YANG Dafeng. Research on the Development of Zhengzhou Airport Economy Zone from the Perspective of Financial Support. Policy Research (Lower), 2019, (2): 6-7. DOI: 10.16324/j.cnki.jcts.2019.02.003.
9. Gibbons S, Wu W. Airports, access and local economic performance: Evidence from China. Journal of Economic Geography, 2020, 20(4): 903-937. DOI:10.1093/jeg/lbz021.
10. Pot F J, Koster S. Small airports: Runways to regional economic growth?. Journal of Transport Geography, 2022, 98: 103262. DOI: 10.1016/j.jtrangeo.2021.103262.
11. Raimundo R J, Baltazar M E, Cruz S P. Sustainability in the airports ecosystem: A literature review. Sustainability, 2023, 15(16): 12325.DOI: https://doi.org/10.3390/su151612325.
12. ZHOU Zhengming, ZHENG Xinru, ZHOU Shupeng. Inclusive Financial Demand and Bank Service Innovation under the Background of Developing New-Quality Productive Forces. Agricultural Development and Finance, 2024, (11): 49-52.DOI: https://doi.org/10.1016/j.jbankfin.2021.106055.
13. Sartzetaki M, Karampini T, Karagkouni A, et al. Circular economy strategies in supply chain management: An evaluation framework for airport operators. Frontiers in Sustainability, 2025, 6: 1558706.DOI: https://doi.org/10.3389/frsus.2025.1558706.
14. Wang D, Zhao X, Shen L, et al. Industry choice for an airport economic zone by multi-objective optimization. Journal of Air Transport Management, 2020, 88: 101872.DOI: https://doi.org/10.1016/j.jairtraman.2020.101872.