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HOW DOES THE BUSINESS ENVIRONMENT EMPOWER ENTREPRENEURSHIP? ——EVIDENCE FROM CHINESE PREFECTURE-LEVEL CITIES

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Abstract: Optimizing the business environment and promoting entrepreneurship vigorously are crucial measures to implement the innovation-driven strategy, stimulate the vitality of market entities, and achieve high-quality economic development. Using a sample of entrepreneurship cultivation across 280 prefecture-level cities in China, based on the perspectives of the New Institutional Economics school and the Complex Systems view, and employing configurational thinking, this study employs fuzzy set qualitative comparative analysis (fsQCA) to investigate the multifaceted concurrent factors influencing entrepreneurship and the complex pathways for its cultivation. The study reveals the following findings: (1) None of the seven constituent elements within the business environment independently constitutes a necessary condition for high entrepreneurship, yet high levels of public services, financial services, and innovation environment universally contribute to fostering entrepreneurship. (2) There are three pathways to achieving high entrepreneurship: administration-assisted innovation-driven, market-driven supported by resources, and input-driven innovation-driven. (3) In cases where urban areas lack key elements or exhibit poor performance across all conditions, the cultivation and stimulation of entrepreneurship are hindered. This research enriches the understanding of antecedents influencing the formation of entrepreneurship and provides practical insights for optimizing the business environment to foster entrepreneurship.
Keywords: Entrepreneurship; Business environment; Fuzzy set qualitative comparative analysis

1 INTRODUCTION

The 19th National Congress of China emphasized the need to "stimulate and protect entrepreneurship" and "encourage more social entities to engage in innovation and entrepreneurship". Similarly, the 20th National Congress highlighted the importance of "promoting entrepreneurship" and "accelerating the development of world-class enterprises". Since entering the new era, China's economic development has shifted from pursuing high-speed growth and quantity expansion to pursuing high-quality development and qualitative enhancement. Achieving high-quality development urgently requires the active role of entrepreneurship. Despite increasing recognition and emphasis on entrepreneurs and entrepreneurship after 40 years of reform and opening up, the lifespan of new enterprises in China has shortened, and the proportion of entrepreneurial failures continues to rise [1]. Provinces across the country face the challenge of low levels of entrepreneurship and are in a state of stagnation [2]. Therefore, addressing how entrepreneurs can lead innovation-driven development and enhance the overall level of entrepreneurship in China has become a critical and pressing issue.

Institutional provision's effectiveness is crucial for fostering innovation and overcoming developmental uncertainties [3]. For entrepreneurs, effective institutional provision signifies a favorable business environment [4], which enhances their circumstances, increases their willingness to invest in R&D, and yields high levels of innovative output [5-6]. Therefore, a conducive regulatory framework is pivotal in stimulating entrepreneurship. From an institutional perspective, administrations with higher administrative management quality can facilitate entrepreneurship by providing abundant information channels, reducing unnecessary administrative interventions [7-8]. Simultaneously, establishing administrative approval centers by administrations simplifies approval processes; more standardized management reduces interaction costs between businesses and administrations, thereby enhancing individual entrepreneurial probabilities [9-10]. This decreases firms' institutional transaction costs, alleviates financing constraints, and boosts entrepreneurship [11-12].

administration economic functions, represented by administration size, primarily augment social public goods and services, thereby improving the production and operational environment for regional enterprises, further enhancing entrepreneurial supply levels[13]. However, evidence suggests that regional administration corruption not only fails to curb entrepreneurship but also stimulates entrepreneurial activities [14-15]. Regarding business environment factors, improved property rights and commercial systems enhance residents' entrepreneurial inclinations [16]. Digital technologies, owing to their social attributes, introduce uncertainty in digital innovation, thereby crucially triggering entrepreneurship [17]. Breakthroughs in communication technologies within the digital economy context foster flat organizational forms, simultaneously enlarging market information scale and lowering information acquisition costs, thus becoming a significant force in stimulating entrepreneurship [18].

Furthermore, an effective financial system enhances entrepreneurial vitality by alleviating financing constraints, risk-sharing, and promoting competition [19-20]. A robust financial ecosystem improves resource allocation efficiency

and entrepreneurship [21]. In line with the demand for financial innovation among entrepreneurs, inclusive digital finance, characterized by its digital nature, inclusiveness, and accessibility, aligns seamlessly with entrepreneurship [22-23].

Based on the above analysis, entrepreneurship has become a crucial force in promoting economic growth and achieving high-quality development in the new era. However, existing research on entrepreneurship lacks sufficient exploration of its relationship with the business environment. On one hand, current literature often discusses the role of entrepreneurship as an intermediary or moderating mechanism in the economic outcomes of the business environment. On the other hand, studies predominantly focus on the impact of individual business environment factors on innovation or entrepreneurship, overlooking the elevation to the level of entrepreneurship. This oversight neglects the concurrent causality and asymmetry between the business environment and entrepreneurship, as well as the equivalence in the formation of entrepreneurship—a complex and multifaceted process involving multiple mechanisms and pathways.Therefore, this paper aims to adopt a holistic approach guided by institutional theory and a complex systems view. Using the cultivation of entrepreneurship across 280 cities as a sample, the study employs a configurational perspective to investigate the complex and diverse entrepreneurial ecosystem shaped by the business environment. By doing so, it aims to provide theoretical foundations and practical insights for better fostering entrepreneurship and promoting high-quality economic development.

2 THEORETICAL FOUNDATIONS AND MODELS

2.1 The New Institutional Economics School and the Complex Systems Perspective

The New Institutional Economics, represented by figures such as Coase, North, and Williamson, strongly emphasizes the role of institutions in economic and social contexts. They argue that institutions, as social 'rules of the game,' encompass both external coercive and punitive rules, as well as internal self-imposed constraints, thereby constraining human behavior and guiding it towards rational expectations [24]. In contrast, the complexity theory posits that market entities characterized by high correlation, interactive adaptation, and competitive interaction often seek multiple solutions rather than optimal equilibrium in economic systems. When facing environmental changes, they engage in learning and adaptation, gradually evolving into diverse complex ecosystems.Thus, the business environment under institutional provision reflects comprehensive levels in rule of law, technology, and market aspects. However, due to differences in urban development strategies, resource endowments, and developmental stages among cities, the development of business environments across cities is asynchronous [25]. Consequently, the mechanisms and pathways for fostering entrepreneurship under these conditions are inevitably complex and diverse.

2.2 Business Environment Elements and Entrepreneurship

The term 'business environment' originates from the World Bank's 'Doing Business' survey, which considers it as the ease with which businesses can operate in various aspects such as starting a business, obtaining permits, accessing finance, and conducting operations. In recent years, domestic theoretical scholars, businesses, and administrations in China have responded sensitively to the concept of the business environment, attempting to conceptualize and localize it. On one hand, national policies have been enacted to recognize and define the business environment. For instance, in October 2019, the State Council of China issued the 'Regulations on Optimizing the Business Environment,' defining it as 'the various institutional factors and conditions that affect market entity activities in a market economy.' On the other hand, universities and research institutes have localized definitions of the business environment, extracting various constituent elements including market environment, innovation environment, and administration affairs environment.

Among the numerous elements and evaluation indicators of the business environment [26] construction of the Urban Business Environment Evaluation System has exerted significant influence. Specific elements of the business environment include public services, human resources, market environment, innovation environment, financial services, rule of law environment, and administration affairs environment.

According to Drucker, entrepreneurship involves viewing change as routine rather than exceptional on the basis of economic and social theories. He emphasizes that the essence lies not in improving what has already been done well but in doing things that are distinctive. Entrepreneurship, as a crucial source of market vitality, serves as a powerful driver for businesses to secure future success and supports achieving high-quality development. As the economy evolves and environments change, the concept of entrepreneurship has diversified. Miller suggests that it encompasses risk-taking, foresight, and product innovation. William Baumol further distinguishes entrepreneurships into innovative, imitative, non-productive, and rent-seeking types. Schumpeter views entrepreneurs as agents of creative destruction, a perspective inherited and expanded upon by Peter Drucker, who posits that innovation spirit constitutes entrepreneurship [27-28].

Despite varying interpretations among scholars regarding the specific connotations of entrepreneurship, existing literature widely acknowledges and applies innovation spirit and adventurous spirit as core components [29]. Research on the relationship between individual business environment elements and entrepreneurship has laid a foundation for understanding the business environment as an ecosystem, highlighting the synergistic impacts and mechanisms through which its constituent elements influence entrepreneurship.

2.2.1 Public services and entrepreneurship

Public services gauge the level of urban infrastructure development required for both living and production needs, including water, electricity, medical services, and natural gas. According to endogenous growth theory, higher levels of

urban public services are conducive to reducing the mobility costs of innovation factors, enhancing knowledge spillover, and accelerating technology diffusion [30]. Moreover, robust public services provide substantial support for business operations, reducing transaction costs for market entities, enhancing environmental carrying capacity, and influencing investment choices [8]. Well-developed urban infrastructure also lowers the marginal costs of operations for startup enterprises[5]. Therefore, effective public services are likely to foster and stimulate entrepreneurship.

2.2.2 Human resources and entrepreneurship

Human resources encompass the level of human capital and labor supply capabilities in urban areas. The development of innovation and entrepreneurship strategies requires talent support, and the significance of human capital is increasingly emphasized due to phenomena such as the 'Lewis Turning Point' and 'Achilles' Heel.' Existing research indicates that regional human resource levels may significantly influence innovation and entrepreneurship levels [31]. On one hand, both knowledge-based professionals with higher education and creative talents effectively contribute to the growth of urban innovation output. On the other hand, scientific and cultural talents play a promoting role in increasing residents' entrepreneurial possibilities[32]. Therefore, human resource capabilities have become a crucial force in fostering entrepreneurship in cities.

2.2.3 Market environment and entrepreneurship

The market environment primarily refers to the conditions under which urban market entities conduct business activities. A favorable market environment is a crucial driving factor for fostering entrepreneurship [33]. This is because economic activities of enterprises are inherently tied to the market as an environmental platform, and the market plays a decisive role in resource allocation. A more open market environment tends to enhance innovation efficiency [34]. Additionally, market-oriented reforms can boost urban innovation capabilities by promoting competition in product markets [35-36]. Therefore, increasing the degree of marketization significantly contributes to the cultivation of entrepreneurial innovation and entrepreneurship spirit [37].

2.2.4 Innovation environment and entrepreneurship

The innovation environment primarily measures urban innovation inputs and outputs, reflecting the city's emphasis on innovation. The innovation environment creates conditions for knowledge spillover, collaboration, and resource recycling, optimizing regional resource allocation and promoting technology diffusion. Thus, it exerts a positive influence on fostering entrepreneurship.

2.2.5 Financial services and entrepreneurship

The issue of financing constraints has long been a significant factor affecting urban innovation and entrepreneurial vitality. The development of digital finance effectively alleviates this predicament, with private and formal financial sectors complementing each other to drive entrepreneurial innovation [38]. Therefore, a sound financial environment may serve as fertile ground for nurturing entrepreneurship.

2.2.6 Legal environment and entrepreneurship

On one hand, the improvement of intellectual property protection systems not only safeguards the benefits derived from entrepreneurial innovation and business activities but also reduces risks such as exploitation and extortion encountered by entrepreneurs. On the other hand, a higher level of legal governance can also maintain and improve relations between enterprises and banks. The establishment of a credit system to some extent helps reduce discrimination by commercial banks against small and medium-sized enterprises, making it easier for enterprises to obtain financial support and alleviate funding issues associated with innovation and entrepreneurship activities [39]. A sound legal environment encourages market-oriented innovation, emphasizes intellectual property protection, and serves as a 'shield' for innovation and entrepreneurship. Strengthening the legal foundation is fundamental to cultivating a healthy and proactive entrepreneurship [40].

2.2.7 Administrative environment and entrepreneurship

The attitude of entrepreneurs towards innovation is influenced by administration interventions in the economy. Reducing micro-level administration interventions can effectively unleash entrepreneurial capabilities and enhance the vitality of market entities [41]. Unlike the Western 'night-watchman' state, local administrations in China are committed to building a proactive administration and fostering a new type of administration-business relationship. This facilitates positive interactions between administration and enterprises, providing confidence and support for entrepreneurial economic activities. Therefore, a favorable administrative environment is crucial for nurturing entrepreneurship and fostering prosperity .

2.3 Theoretical Model: Complex Paths and Mechanisms for Fostering Entrepreneurship in the Business Environment from a Group Perspective

The new institutional economics argues that institutional environment, as a form of social rules, not only constrains relationships between actors, but also influences organizational activities of individuals within society. Therefore, entrepreneurial activities of market entities are responses to institutional environments. According to the complex systems perspective, on the one hand, market entities within the same environment, highly interconnected and interactive, compete and cooperate when faced with new conditions, continually adjusting behaviors and strategies to seek more actions [42]. On the other hand, the evolution of the business environment ecosystem also significantly impacts regional entrepreneurial activities. Serving as the platform for conducting business activities, the business environment interacts with enterprises to generate agglomeration effects of talents, capital, and opportunities, providing resource support conducive to empowering innovation and entrepreneurship, and nurturing entrepreneurship [43].

Therefore, understanding how different business environment ecosystems manifest multiple configuration modes and thus create diverse pathways to foster and stimulate entrepreneurship has become an urgent issue. This paper, based on institutional theory and complex systems view, employs configuration thinking to analyze the necessary and sufficient causal relationships between business environment and entrepreneurship, aiming to uncover the complex and diverse pathways through which business environment ecosystems foster entrepreneurship, as depicted in theoretical model in Figure 1.

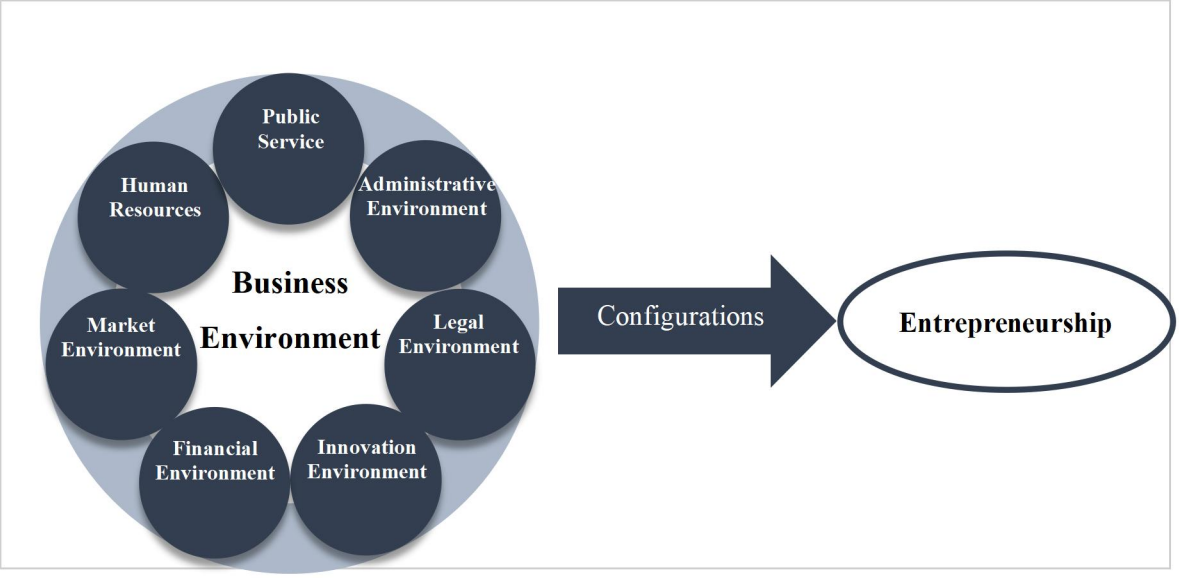

Figure 1 Theoretical Model: The Complex Path of Fostering Entrepreneurship in the Business Environment

3 RESEARCH DESIGN

3.1 Research Methodology

QCA (Qualitative Comparative Analysis) is a new method proposed by Ragin in 1987 that adopts a holistic perspective to explain necessary and sufficient causal relationships among cases using set relations and configurational effects. On one hand, QCA can handle both medium to large-scale research samples and is also suitable for small-scale research samples. On the other hand, QCA departs from traditional single-factor quantitative regression analysis, offering a new research paradigm to study how the joint effects of correlated variables influence outcomes [44]. Compared to traditional qualitative research, QCA overcomes the limitations of sample size constraints. Compared to traditional quantitative analysis, QCA method addresses the complexity of social phenomena involving multiple concurrent factors, assuming non-linear and substitutive relationships between conditions and outcome variables [45]. Therefore, QCA, as a mixed qualitative and quantitative research method based on case studies, demonstrates significant advantages in resolving issues of multiple causality.

This study selects the specific cultivation of entrepreneurship across 280 prefecture-level cities in China as its sample, discussing the complex nurturing mechanisms and pathways of entrepreneurship influenced by various components of the business environment. The study sample of entrepreneurship cultivation across 280 prefecture-level cities constitutes a large sample, offering both depth and breadth in case studies while reflecting the complexity of social realities. With 7 identified antecedent conditions, which align with the optimal number of condition variables for medium to large-scale samples, fsQCA method is chosen as more suitable.

3.2 Data Sources

Constructing and measuring specific indicators are essential components of assessing the business environment. Despite the World Bank's prior release of a comprehensive indicator framework, domestic scholars in China have conducted extensive theoretical research and practical exploration on evaluating the business environment and constructing indicator systems, yielding rich research outcomes, referencing materials such as the World Bank's 'Doing Business' report, tailored an evaluation indicator system for the business environment in China, considering the country's economic development realities. They utilized statistical data from various Chinese cities for the years 2017-2018 to measure these indicators, receiving high praise and recognition. Therefore, this study selects Chinese city-level business environment data that better aligns with China's national conditions. The business environment components chosen as antecedent conditions primarily include urban public services, human resources, market environment, innovation environment, financial services, rule of law environment, and administrative environment. Each component is further subdivided into a three-level indicator system, processed using non-dimensionalization and hierarchical weighted aggregation through scientific methods, ensuring comprehensiveness, scientific rigor, and practical applicability.

Scholars such as Schumpeter argued that entrepreneurs achieve innovation through 'recombining factors of production,' while Baumol categorized entrepreneurs into innovative and replicative types based on their economic activities. Peter Drucker, on the other hand, equated entrepreneurship with innovation. Additionally, Western scholars like Coase and Cozzi provided various perspectives on the essence of entrepreneurship. Despite divergent views in academia, innovation spirit and adventurous spirit are recognized as core components of entrepreneurship[46]. Therefore, this study defines entrepreneurship in terms of innovation and entrepreneurship. Data for this study are sourced from the Chinese Urban Database and the Chinese Urban-Rural Construction Database. Considering data availability and the temporal effects of antecedents and outcomes, all indicators related to entrepreneurship in this study are based on data from the year 2019. After matching the data accordingly, a total of 280 urban research cases were included in the sample.

3.3 Measurements And Calibrations

3.3.1 Results

Entrepreneurship primarily encompasses two core elements: innovation spirit and entrepreneurship. This study references relevant research, where innovation spirit is measured using the number of patent applications, and adventurous spirit is measured using the employment in private enterprises and individual businesses [47]. The data were normalized and weighted using the utility value method. The calculation method is as follows: Entrepreneurship = Innovation Spirit (0.5) + Adventurous Spirit (0.5).

3.3.2 Antecedent conditions

In accordance with the '2020 Evaluation of China's Urban Business Environment,' each element of the business environment serves as a primary indicator, synthesized from weighted secondary and tertiary indicators. Foundational indicators were obtained from relevant databases and normalized using the utility value method, resulting in a range of [0, 100] (Li, 2021). The measurement specifics for each element of the business environment are as follows.

(1) Public services. This indicator primarily measures the level of urban infrastructure construction. The calculation method is: Public services = Gas supply (0.25) + Electricity supply (0.25) + Medical services (0.25) + Water supply (0.25). These represent the city's capacity for gas supply, industrial electricity supply, medical and health services, and public water supply as tertiary indicators.

(2) Human resources. This indicator primarily measures the level of urban talent resources and labor force. The calculation method is: Human resources = Human resource reserves (0.7) + Labor cost (0.3). Specifically, human resource reserves include tertiary indicators such as the number of students in regular higher education institutions (0.4), the number of employees at the end of the year (0.3), and net population inflow (0.3). Labor cost is measured by the average wage level in the city.

(3) Market environment. This indicator primarily reflects the level of urban import-export, enterprise conditions, and other economic development situations. The calculation method is: Market environment = Economic indicators (0.4) + Import-export (0.3) + Enterprise structure (0.3). Specifically, economic indicators = Per capita GDP of the region (0.6) + Total fixed asset investment (0.4); Import-export indicators = Actual foreign investment used in the city in the current year (0.6) + Number of newly signed projects in the current year (0.4); and the enterprise structure indicator is measured by the number of large-scale industrial enterprises.

(4) Innovation environment. The innovation environment primarily reflects the city's input and output levels in terms of innovation, indicating the city's attention and emphasis on innovation. The calculation method is: Innovation environment = Innovation input (0.5) + Innovation output (0.5). Specifically, innovation input is measured by scientific expenditures, while innovation output is assessed using the number of invention patents granted.

(5) Financial services. Financial services measure the level of development in the city's financial industry and financing service capabilities. The calculation method is: Financial services = Financial industry employment scale (0.5) + Financing services (0.5). Specifically, the financial industry employment scale is derived from the number of financial industry personnel, while financing services are determined by the overall financing scale of the city (0.5) + scale of private financing (0.5).

(6) Rule of law environment. The rule of law environment reflects the city's security and judicial conditions. The calculation method is: Rule of law environment = Public security (0.3) + Judicial services (0.4) + Judicial transparency (0.3). Specific indicators include the number of criminal cases per 10,000 people, the number of law firms, and the judicial transparency index.

(7) Administrative environment. The administrative environment encompasses the scale of administration services and the level of administrative-business relationships. It consists primarily of administration expenditure (0.5) and administrative-business relationships (0.5), where administration expenditure is measured by general budgetary expenditures within the city, and administrative-business relationships are gauged by the business environment.

3.3.3 Calibration

Calibration in QCA methodology is an essential procedure prior to conducting necessity and sufficiency analysis, involving the assignment of set-membership scores to cases [45]. Considering the data types of condition and outcome variables, and recognizing the lack of unified standards in existing theories and research to define high and non-high levels of business environment and entrepreneurship, this study employs direct calibration to calibrate elements of the business environment and entrepreneurship to reflect relative levels across cities. Thus, this paper sets the 75th percentile, median, and 25th percentile of descriptive statistics of condition and outcome variables as anchor points

representing full membership, crossover point, and full non-membership, respectively. The use of median avoids sensitivity to outliers that might be present with mean values [46]. Additionally, to address configuration membership issues arising from condition variables having a membership degree exactly at 0.50, a commonly adopted practice subtracts a constant of 0.001 from the 0.50 membership score. Based on this approach, this paper aims to analyze complex mechanisms and pathways within the business environment that foster high entrepreneurship, drawing substantive conclusions with practical implications based on discussions of typical city cases. See Table 1 for calibration anchor points and descriptive statistics of the sample of condition and outcome variables.

Table 1 Calibration and Descriptive Statistics

Variables	Calibration			Descriptive Analysis			
	Fully in	Neither in or out	Fully out	Mean	SD	Min	Max
Entrepreneurship	7.257	3.665	1.778	7.609	12.421	0.106	94.359
Public Service	8.659	5.213	3.093	7.852	9.122	0.418	72.348
Human Resources	19.344	14.942	12.710	18.355	11.271	4.984	94.830
Market Environment	13.254	8.175	5.191	11.139	10.147	0.254	68.205
Innovation Environment	3.000	1.241	0.424	4.331	10.548	0.015	100.000
Financial Environment	3.801	2.114	1.097	4.495	9.042	0.000	100.000
Legal Environment	49.489	43.760	29.482	40.747	11.779	17.753	77.982
Administration Environment	19.485	14.362	10.549	16.645	10.932	2.219	85.558

4 ANALYSIS OF RESULTS

4.1 Necessity Analysis Of Antecedent Conditions

According to the procedures of the QCA method, prior to conducting the analysis of fuzzy set truth tables, it is necessary to check the necessity of condition variables. Necessity analysis refers to the process of verifying whether "no X, no Y" holds true, where a necessary condition indicates that the condition always exists when a specific outcome occurs, and is considered a superset of the outcome. Importantly, a necessary condition does not imply its inevitable presence in the solution, as it may be eliminated in the simplification process during truth table analysis [47]. In this study, using fsQCA 3.0 software to conduct necessity analysis of high and non-high entrepreneurship, it was found that the consistency levels of individual elements of the business environment were consistently below 0.9, indicating they do not constitute necessary conditions (see Table 2). This suggests that individual elements of the business environment have relatively weak explanatory power for entrepreneurship. Therefore, the subsequent analysis includes all elements of the business environment in fsQCA to further explore the configurations that produce high and non-high entrepreneurship.

Table 2 Analysis of the Need for a Single Element of the Business Environment

Conditions	Outcome-Entrepreneurship	
	High-ENT	Low-ENT
High Public Service	0.816	0.304
Low Public Service	0.321	0.824
High Human Resources	0.749	0.363
Low Human Resources	0.368	0.747
High Market Environment	0.790	0.331
Low Market Environment	0.356	0.806
High Innovation Environment	0.842	0.287
Low Innovation Environment	0.316	0.86
High Financial Environment	0.835	0.312
Low Financial Environment	0.318	0.831
High Legal Environment	0.657	0.426
Low Legal Environment	0.431	0.657
High Administration Environment	0.729	0.371
Low Administration Environment	0.374	0.725

4.2 Sufficiency Analysis Of Conditional Configurations

Conducting sufficiency analysis of condition configurations is central to the QCA method, primarily aimed at testing the sufficiency of different configurations of antecedent conditions for producing outcomes. When using fuzzy set

qualitative comparative analysis, three types of solutions are obtained: complex solutions without "logical remainders," parsimonious solutions that include all "logical remainders" but do not evaluate their plausibility[48], and intermediate solutions that only include conditions consistent with theoretical expectations and empirical evidence. Intermediate solutions, due to their advantage of not allowing the elimination of necessary conditions, become the primary choice for reporting and interpreting QCA method results [49]. Furthermore, the QCA method requires users to distinguish between core and peripheral conditions of configurations. A condition is considered core if it appears in both parsimonious and intermediate solutions, indicating its significant impact on the outcome. Conversely, if a condition only appears in the intermediate solution, it is deemed peripheral, contributing only marginally to the outcome .

This study sets the original consistency threshold at 0.8, the PRI (Proportional Reduction in Inconsistency) consistency threshold at 0.7, and based on sample size considerations for city cases, sets the case frequency threshold at 3 for enhancing persuasiveness and reliability of conclusions. Due to inconclusive literature regarding whether individual elements of the business environment affect entrepreneurship, this research adopts a cautious approach during counterfactual analysis, acknowledging that the presence or absence of single business environment elements may influence the cultivation and stimulation of entrepreneurship. The sufficiency analysis results of condition configurations obtained in this study are presented in Table 3.

Table 3 Conditional Grouping Sufficiency Analysis Results

Conditions	High Entrepreneurship			Low Entrepreneurship					
	HE1	HE2	HE3	NE1	NE2	NE3	NE4	NE5	NE6
Public Service	●	●	●	⊗	⊗	⊗	⊗		⊗
Human Resources		●	⊗			⊗	⊗	⊗	⊗
Market Environment	●	●	⊗	⊗	⊗			⊗	⊗
Innovation Environment	●	●	●	⊗	⊗	⊗	⊗	⊗	⊗
Financial Environment	●	●	●	⊗	⊗	⊗	⊗	⊗	
Legal Environment	⊗	●	●		⊗	⊗		⊗	⊗
Administration Environment	●		⊗	⊗			●	⊗	⊗
Consistency	0.973	0.979	0.961	0.936	0.946	0.937	0.937	0.953	0.951
Row coverage	0.194	0.457	0.088	0.510	0.439	0.402	0.195	0.355	0.353
Unique coverage	0.123	0.371	0.031	0.116	0.022	0.014	0.030	0.024	0.021
Solution consistency		0.973				0.921			
Solution coverage		0.618				0.677			

Note: ●indicates the existence of the core condition, ● indicates the existence of the edge condition, U indicates the absence of the core condition, U indicates the absence of the edge condition, and a space indicates that it is insignificant to the result.

4.2.1 Ecosystems leading to high entrepreneurship

Administration-enabled innovation-driven. Based on configuration HE1, a administration-supported innovation-driven model is depicted, where high levels of public services, market environment, financial services as well as good governance are peripheral conditions, while a high level of innovative environment stands as the core condition, and a non-high level of legal environment serves as a peripheral condition. This business environment ecology can foster high entrepreneurship. Representative cities of this configuration include Kunming, Changchun, Nanchang, Zhengzhou, Harbin, and Mianyang.

This pathway reflects that in cities where the legal environment is relatively underdeveloped, but there is strong infrastructure, good administration-business relations, and a favorable market environment conducive to investment and financing activities, market entities actively engage in innovation activities, making the city fertile ground for entrepreneurship. On one hand, the administration actively maintains market order, combats unfair competition, and promotes a harmonious and orderly market competition environment. On the other hand, the administration implements "decentralization, regulation and service" reforms, promptly responds to legitimate demands of enterprises, protects their lawful rights and interests, and strives to build a new type of administration-business relationship that is both supportive and transparent.

For example, Kunming has implemented the "Yunnan Province's Implementation Plan for Creating a Market-Oriented, Legal and International First-Class Business Environment" in 2020, focusing on efficient and harmonious market environment through initiatives such as "no need to rely on others for handling matters," "one visit handling for approvals," and other streamlined processes. In recent years, Yunnan Province has introduced policies such as the "Yunnan Province Optimizing Business Environment Regulations" and the "23 Measures to Enhance Legalized

Business Environment in Yunnan Province," aiming to create a top-tier business environment and promote market-oriented, legal, and international business environments while building and maintaining a supportive and transparent new type of administration-business relationship. Concurrently, Kunming has achieved notable progress in its innovation environment. According to data from the Kunming Science and Technology Progress and Innovation Regulation, the number of high-tech enterprises in Kunming reached 1,786 by 2022, an increase of approximately 255% from 699 in 2016. Research and development expenditures reached 12.8 billion RMB, with an annual growth rate of 9.25%. In 2022, the turnover of technology contracts reached 8.426 billion RMB, doubling over the past three years. Therefore, deeply implementing the innovation-driven development strategy and building a favorable market environment and administration-business relations are advantageous pathways to cultivating entrepreneurship and achieving high-quality economic development.

Resource-Supported Market-Driven Model.Configuration HE2 indicates that a business environment ecosystem with high human resources, high innovation environment, high financial services, and high legal environment as peripheral conditions, and high public services and high market environment as core conditions, can better cultivate and stimulate entrepreneurship. The main representative cities of this pathway include Beijing, Shanghai, Guangzhou, Shenzhen, Chengdu, Nanjing, and Hangzhou. The six cities in China that conducted pilot business environment reforms in 2021 are also included in this category.

These cities demonstrate that when urban infrastructure is well-developed, the financial industry is flourishing, and society is stable with orderly judicial systems, sufficient resource support and property protection are provided to market entities. This attracts market entities to actively invest in and establish enterprises, engage in import and export trade activities, and attract talent, further contributing to urban development.

For example, Chengdu, a leading city in western China, successfully served the fourth-largest population in the country with the seventh-largest economic output in 2022. As a pilot city for the national standardization of basic public services, Chengdu has actively innovated in the organization and supply of public services, deepening reforms, and has become the city with the highest satisfaction with public service quality in the country. In January 2023, Chengdu launched its fifth round of business environment reforms, focusing more on optimizing the market environment. This reform addresses areas such as market entry and exit, investment construction, industrial services, cross-border trade, market barriers, new regulatory frameworks, and operating costs, aiming to build a business environment led by the market and governed by industry self-discipline. Chengdu's national ranking of sixth in public service levels and eighth in market environment levels demonstrates that cities must perfect infrastructure construction, provide ample material and human resources for market entities, and focus on creating an orderly competitive market environment. Only then can entrepreneurship be effectively cultivated and stimulated, achieving the ideal of "deep water attracts fish, and strong cities attract merchants."

Input-Driven Innovation Model.According to configuration H3E, an ecosystem characterized by high public services and a high innovation environment as core conditions, the absence of a administrational environment as a core condition, and the presence of high legal environment and high financial services as peripheral conditions, along with the absence of high human resources and high market environment as peripheral conditions, can lead to high entrepreneurship. Representative cities include Xingtai, Jingzhou, and Shaoyang.

These cities demonstrate that when urban infrastructure is relatively well-developed and public services reach a considerable level, but labor reserves are lacking and market vitality is insufficient, high entrepreneurship can only be achieved through increased innovation investment. For instance, Xingtai ranks 69th nationally in public service levels and 103rd in innovation environment scores, both in the upper or upper-middle tiers. In recent years, Xingtai has accelerated the construction of an innovative city by promoting technological innovation through multiple channels, including R&D investment, park upgrades, innovation entities, innovation platforms, technological innovation, and open innovation. The city's total social R&D investment has grown by more than 10% annually, and its provincial ranking in R&D investment intensity has steadily risen. This innovation-driven approach deeply advances the coordinated development of the Beijing-Tianjin-Hebei region and accelerates the creation of a new engine for high-quality development. Therefore, in the path of optimizing the business environment, cultivating entrepreneurship, and achieving high-quality urban economic development, innovation investment is an indispensable component.

4.2.2 Ecosystems leading to low entrepreneurship

Due to the premise of causal asymmetry in QCA methodology, it is also necessary to analyze the business environment ecosystems that lead to low entrepreneurship. This study identified six configurations (NE1-NE6) associated with low entrepreneurship. A comprehensive comparison of these configurations reveals that when a city's business environment ecosystem lacks an innovation environment and financial services as core conditions, or lacks an innovation environment and public services as core conditions, it is often detrimental to the cultivation and stimulation of entrepreneurship. Additionally, when all elements of the city's business environment ecosystem perform poorly, it is challenging to foster high entrepreneurship and achieve high-quality development.

4.3 Robustness Tests

Facing the gradual development and improvement of robustness tests in QCA research, numerous methods have been proposed and applied in practice. However, given the set-theoretic nature of QCA, it is recommended to prioritize set-theoretic-specific methods for robustness testing [50]. When slight modifications in operations result in outcomes that exhibit a subset relationship, it indicates that the substantial interpretation of the research findings remains

unaffected, thus confirming the robustness of the results [51]. Based on this premise, this study employs changes in the consistency threshold to address threats posed by parameter settings and conducts robustness tests accordingly. After raising the PRI consistency from 0.7 to 0.75, it was found that the configurations obtained remained largely consistent with the existing configurations. These robustness test results confirm that the findings of this study are robust.

4.4 Heterogeneity Analysis

Due to historical path dependence, geographical environment, openness to the outside world, and cultural factors, China's economic focus has gradually shifted to the southern regions. Even at its lowest point, the economic center in the south has remained higher than that in the north and has not shifted for nearly a thousand years. Therefore, this paper conducts further heterogeneity analysis on the business environment and entrepreneurship between the southern and northern regions of China. By splitting the data of the 280 prefecture-level cities into 152 southern cities and 128 northern cities, and following the fsQCA case frequency setting principle, the case frequency was set to 2, with the original consistency threshold still at 0.8 and the PRI consistency set at 0.7. The results reveal that the paths to cultivating and stimulating entrepreneurship in the southern regions mainly resemble the administration-assisted innovation-driven type (HE1) and the resource-supported market-driven type (HE2). In contrast, the northern regions rely mainly on resource support (NHE2, NHE3, NHE4), presenting inconsistencies with the southern regions. This indicates significant differences in the business environment between northern and southern China, and the mechanisms and paths for fostering entrepreneurship also differ. Consequently, relevant administrations should fully consider regional differences and adapt to local conditions when creating a favorable business environment (See Table 4 and 5).

Table 4 Results of the Northern Cities Conditional Grouping Sufficiency Analysis

Conditions	High Entrepreneurship					Low Entrepreneurship				
	NHE1	NHE2	NHE3	NHE4	NHE5	NNE1	NNE2	NNE3	NNE4	NNE5
Public Service	⊗	●	●	●	●	⊗	⊗		⊗	⊗
Human Resources	⊗	●		●	●		⊗	⊗	⊗	●
Market Environment	●		●	●	●	⊗	⊗	⊗	⊗	●
Innovation Environment	●	●	●	●	●	⊗	⊗	⊗	⊗	⊗
Financial Environment	⊗	●	●	●	⊗	⊗	⊗	⊗		⊗
Legal Environment		●	●		⊗			⊗	⊗	⊗
Administrative Environment	⊗	⊗	⊗	●	⊗	⊗		⊗	●	●
Consistency	0.917	0.974	0.996	0.980	0.945	0.948	0.936	0.955	0.910	0.925
Row coverage	0.129	0.147	0.167	0.499	0.068	0.495	0.543	0.340	0.188	0.067
Unique coverage	0.043	0.016	0.012	0.418	0.015	0.062	0.068	0.018	0.025	0.020
Solution consistency	0.966					0.932				
Solution coverage	0.673					0.669				

Note: ●indicates the existence of the core condition, ● indicates the existence of the edge condition, U indicates the absence of the core condition, U indicates the absence of the edge condition, and a space indicates that it is insignificant to the result.

Table 5 Results of the Southern Cities Conditional Grouping Sufficiency Analysis

Conditions	High Entrepreneurship		Low Entrepreneurship					
	SHE1	SHE2	SNE1	SNE2	SNE3	SNE4	SNE5	SNE6
Public Service	●	●		⊗	⊗	⊗	⊗	●
Human Resources		●	⊗		⊗	⊗		⊗
Market Environment	●	●	⊗	⊗	⊗		●	●
Innovation Environment	●	●	⊗	⊗		⊗	⊗	⊗
Financial Environment	●	●	⊗	⊗	⊗	⊗	⊗	●
Legal Environment		●	⊗	⊗	●	⊗	●	●
Administrative Environment	●		⊗	⊗	⊗	●	⊗	●

Consistency	0.978	0.982	0.950	0.945	0.951	0.935	0.974	0.977
Row coverage	0.182	0.517	0.373	0.405	0.243	0.168	0.127	0.070
Unique coverage	0.104	0.439	0.019	0.049	0.074	0.044	0.023	0.018
Solution consistency		0.981			0.931			
Solution coverage		0.621			0.632			

Note: ●indicates the existence of the core condition, ● indicates the existence of the edge condition, U indicates the absence of the core condition, U indicates the absence of the edge condition, and a space indicates that it is insignificant to the result.

5 CONCLUSIONS AND INSIGHTS

5.1 Conclusions Of The Study

Optimizing the business environment and promoting entrepreneurship have become focal points of research for fostering economic growth and achieving high-quality development. This paper examines the cultivation and stimulation of entrepreneurship in 280 prefecture-level cities in China. Guided by institutional economics and complex systems theory, and from the perspective of the business environment, this study employs configurational thinking and the QCA method to deconstruct the multiple concurrent factors and complex causal mechanisms that lead to differences in the cultivation and stimulation of entrepreneurship. Specifically, this analysis focuses on seven conditional variables: public services, human resources, market environment, innovation environment, financial services, legal environment, and administration environment. The study identifies multiple pathways within the business environment ecosystem that better cultivate and stimulate entrepreneurship.

First, this paper, through necessity analysis, finds that none of the seven specific elements of the business environment ecosystem can independently constitute the necessary condition for cultivating entrepreneurship, indicating that a single element of the business environment is insufficient to explain the stimulation of entrepreneurship. However, by comparing the three pathways that better cultivate and stimulate entrepreneurship, it is found that improving the level of urban public services, actively promoting the development of the financial industry, and optimizing the urban innovation environment play a universal role in promoting entrepreneurship.

Second, the configurational analysis reveals three types of business environment ecosystems that lead to high levels of entrepreneurship: administration-assisted innovation-driven, resource-supported market-driven, and investment-driven innovation. On one hand, these findings indicate that there is no single path to cultivating and stimulating entrepreneurship in cities; on the other hand, they reflect different mechanisms at various stages of urban development for fostering entrepreneurship.

Finally, the six configurations associated with low entrepreneurship indicate that when cities lack innovation environments, financial services, or public services, or when the overall development level of various elements in the urban business environment ecosystem is poor, the vitality of market entities cannot be stimulated, nor can entrepreneurship be promoted. This also reflects the causal asymmetry in the factors leading to differences in urban entrepreneurship.

5.2 Theoretical Contributions

The contributions of this study can be summarized as follows:

First, drawing on perspectives from the new institutional economics and complex systems theory, this paper comprehensively considers combinations of business environment elements that promote entrepreneurship. Utilizing configurational analysis, it reveals the complex pathways and mechanisms for nurturing entrepreneurship, identifying convergent paths where the business environment empowers entrepreneurship. This enriches theoretical understanding in the field of entrepreneurship.

Second, previous studies often focused on single elements representing the business or institutional environment in relation to entrepreneurship, neglecting the complexity of the business environment as a system. This study takes a holistic approach, integrating considerations of the complex business environment system's impact on entrepreneurship. It provides a novel perspective for research on the relationship between business environment and entrepreneurship, addressing gaps in previous studies.

Third, based on configurational analysis, this study uncovers diverse business environment ecosystems conducive to entrepreneurship formation, thereby elucidating the "black box" of how business environments foster entrepreneurship.

Lastly, this paper contributes to the empirical support for understanding the heterogeneity of entrepreneurship across northern and southern regions of China, offering insights for stimulating entrepreneurship in urban settings.

5.3 Implications For Practice

5.3.1 Systematic perspective and holistic thinking

Unlike previous studies that focused on the impact of a single business environment factor on entrepreneurship, this study reveals that nurturing and stimulating entrepreneurship requires an effective ecosystem of multiple business environment factors. According to the configuration paths that lead to high entrepreneurship, it is clear that activating entrepreneurship necessitates the synergistic interaction of various business environment factors. Thus, policy-making

should adopt a systematic perspective, foster holistic thinking, and coordinate business environment factors to avoid neglecting any crucial elements.

5.3.2 Targeted efforts and focused action

The research results indicate that the effectiveness of fostering entrepreneurship is influenced by a combination of various business environment factors, with different configurations achieving the same goal. Considering objective realities such as resource levels, cities should prioritize business environment factors that universally impact the cultivation of entrepreneurship, such as the innovation environment and the development level of financial services. This will provide favorable conditions for stimulating the vitality of market entities.

5.3.3 Localized solutions and active exploration

Although the research identifies multiple paths and driving mechanisms for nurturing and stimulating entrepreneurship, it does not imply that these paths are suitable for all cities, nor does it suggest that the mechanisms identified in this study are the only ones. Therefore, cities should explore new paths and mechanisms for fostering entrepreneurship in accordance with their unique characteristics and resource endowments, creating city-specific approaches to cultivating entrepreneurship and achieving high-quality economic development.

5.4 Research Limitations And Prospects

This study has several limitations. Firstly, it employs only static data; future research could incorporate temporal factors and utilize Temporal Qualitative Comparative Analysis (TQCA) for deeper analysis. Secondly, the business environment is a complex ecosystem comprising multiple factors. Future research could further refine and consider the specific elements of the business environment.

COMPETING INTERESTS

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