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Does the Improvement of the Business Environment Improve the Innovation Efficiency of Enterprises? Evidence from the Listed Companies in China

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Abstract: The quality of the business environment influences the speed and quality of economic development, and optimizing the business environment helps improve enterprises' innovation ability. This article selects urban business environment and micro-enterprise data of Chinese listed companies from 2013 to 2019. It constructs a comprehensive evaluation index system for the urban business environment in China through the entropy method, exploring the specific path of promoting enterprise innovation ability through the business environment. The empirical results indicate that optimizing the business environment can encourage improving innovation efficiency in enterprises. A good business environment can increase government subsidies and enterprises' Assumption of risk ability to promote technological innovation. Financing constraints and supply chain concentration can negatively enhance the driving effect of the business environment on enterprise innovation. Heterogeneity analysis indicates that the business environment is more conducive to stimulating the drive for technological innovation among state-owned enterprises, large-scale enterprises, and manufacturing enterprises. This article provides new insights into the relationship between the business environment and the innovation efficiency of enterprises.

Keywords: business environment; enterprise innovation efficiency; entropy method; mediation effect analysis

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1. Introduction

The term "business environment" encompasses outside factors and circumstances connected to the governmental atmosphere, marketplace surroundings, legislative surroundings, cultural surroundings, etc. [1]. It is a significant factor influencing how sustainably commercial businesses develop globally. In the era of economic globalization, creating an international first-class business environment, following the new trends of economic globalization, and the new changes in the global situation are not only conducive to stabilizing market expectations and stimulating market activity but also conducive to attracting foreign investment and enhancing China's international competitiveness [2]. In recent years, China has issued a series of rules and regulations to optimize the regional business environment. The aims are incorporating the "Business Environment Report" into the measurement system of economic development level, thus triggering more discussions on the "best business environment", releasing market vitality [3], and promoting more inclusive and sustainable economic growth [4].

The business environment is viewed as a soft organizational surrounding from the standpoint of transaction costs, representing the soothing influence of a nation or region's

economic development and the significance of a nation or region's innovation capabilities [5]. Enterprises' economic activities significantly impact the Socialist market economy [6]. Compared to developed countries, the path for micro-enterprises in developing countries to improve their technological innovation level by optimizing their business environment is unique. Under the model of national innovation encouragement, domestic enterprises have formed two models: closed innovation and open innovation, both of which can improve enterprise innovation capabilities to varying degrees [6]. This requires further discussion of its underlying impact mechanism. This further discusses whether the optimization of the business environment can promote innovation in enterprises, and what is its internal impact mechanism? The research on these issues will provide important theoretical value and practical significance for enterprises to enhance their technological innovation capabilities, for the government to formulate policies to optimize the business environment, and accelerate the construction of an innovative country.

There are two main types of literature related to this study. On the one hand, scholars examine the research on the impact of the business environment on enterprise technological innovation from a multidimensional perspective. For example, Feng and Zhang [7] conducted theoretical analysis and empirical testing on the effect of the business environment on financial literacy and enterprise technological advance. On the other hand, scholars conduct preliminary research based on a specific type of business environment dimension. For example, Nam et al. [8] proposed that optimizing the business climate can weaken the crowding out influence of relational financing on corporation product advances and encourage innovative enterprise ideas. Xu and Zhu [9] used the estimation of the maximum likelihood method to examine the influence and heterogeneity of the tax business environment on enterprise innovation efficiency. Howell et al. [10] found that countries with well-developed administrative systems and high regulatory efficiency can attract more foreign investment. Qiang et al. [11] and Andersson et al. [12] proposed that regions with complete laws and clear property rights can maintain entrepreneurs' awareness of innovation and safety and push companies to develop innovative products. Some studies have also proposed quantitative dimensions and evaluation indicators for the business environment but have yet to answer how the business environment affects enterprise technological innovation.

Although many studies, both domestically and internationally, focus on the impact of the regional business environment on innovation, there needs to be more research exploring the impact of the regional business environment on enterprise innovation. Existing research has shortcomings, such as concentrated research objects, vague core indicator measures, and a need for internal mechanisms. Therefore, based on existing research, the effect and trajectory of the business environment on company innovation are examined in this paper from theoretical and empirical perspectives using data from Chinese-listed firms and cities from 2013 to 2019, providing a decision-making basis for enterprises to improve innovation capabilities. The contributions of this paper are as follows: (1) On a theoretical basis, based on the microeconomic model framework such as resource signaling theory and Schumpeter innovation theory, this paper uses the mediating effect model to conduct empirical analysis. It constructs a theoretical model of the business environment affecting enterprise innovation capability, further revealing the internal mechanism of the business environment improving enterprise innovation efficiency. (2) In terms of indicator selection, from the perspective of Ecological systems theory, this paper develops a thorough business climate assessment composite index including six layers of public facilities, financial ecosystem, human resources environment, market situation, and creative atmosphere. It uses multiple methods to test robustness, enhancing empirical results' credibility. (3) In terms of heterogeneity, given the heterogeneity of enterprises in terms of property rights, business scope, scale, and other aspects, this study investigates how the corporate environment affects the creative capacities of various firms, which can provide theoretical reference for each enterprise to accurately formulate innovation efficiency improvement paths that are

in line with their actual situation. Therefore, this article provides new insights into the relationship between the business environment and the innovation efficiency of enterprises.

2. Literature Review

2.1. Studies on the Business Environment

The business environment is an important factor affecting market vitality [13]. Currently, research on the business environment mainly focuses on indicator systems and evaluation methods, internal mechanisms of action, and the relationship to the social economy.

Scholars have established different evaluation system models from different levels of evaluation objects, index content, evaluation methods, and other factors, among which business report from the World Bank has the most global influence [14]. Most scholars select indicators and strategies based on the World Bank and in combination with their research object level and research focus: The improvement of the worldwide supply chain in Bria was measured by He et al. [15] and others using comprehensive indicators. Vevere et al. [16] employed factor analysis to assess the business climate of a single nation. The analysis of the principal components approach was used by Ekel et al. [17] and others to investigate the South American business environment cost index.

The effect mechanism of business environment refers to the process of constructing an overall system structure from the perspective of influencing factors, and exploring the influence of explanatory variables on the dependent variables. Some paper combs the influencing factors and interrelationships of the business environment, Subhashish [18] talked about how technology, the business world, society, and ICT industry regulations interact. Others analyze the influence of relevant factors on the business environment from a specific perspective. Kozubikova et al. [19] investigated how technical elements affect the corporate environment using a regression model. Eva et al. [20] analyzed the economic environment and concludes that SME finance significantly influences the local business climate.

It is essential to highlight that academics primarily examine the course of the corporate environment's influence on economic expansion and advancement. Shengbing and Huilin [21] found that upgrading the human capital structure played an intermediary role in affecting economic development. The spatial Debin model was used by Tongtong and Fangyi [22] and others to investigate the existence of a geographical spillover influence on the business environment. Second, it's vital to demonstrate the variability of the association of the indicators to investigate how the business environment affects the economy and society at the indicator level. The business environment policy's implementation effect in developed cities is more pronounced [23]. The high-quality urban development of cities is influenced by national and urban agglomeration heterogeneity [24].

2.2. Research on Enterprise Innovation Capability

Enterprise innovation is the key to industrial upgrading, and it is an inevitable requirement and essential link to promote industrial transformation and enterprise development. Currently, measurement methodologies and influencing factors are the critical areas of interest for research on enterprise innovation capabilities.

The methods for measuring enterprise innovation capability can be roughly divided into three categories: qualitative evaluation, quantitative evaluation, and comprehensive evaluation. The quantitative analysis method has been widely used in efficiency measurement. The enterprise TFP measurement based on production function has made a lot of development [25], resulting in the OP method with investment as the proxy variable, the LP method [26] with intermediate input as the proxy variable, the ACF method [27], the Woodridge method, etc. Stochastic frontier methods tend to measure non-efficiency [28], and SBM methodology [29] are also used to assess the technological effectiveness of businesses. The CDM model is based on the simultaneous equation that takes labor productivity

as the dependent variable. The knowledge production function of R&D is introduced to determine an enterprise's innovation efficiency [30].

Additionally, scholars have explored the influencing factors of enterprise innovation capability from different perspectives. From an individual perspective, the reputation of executives can significantly promote the effectiveness of enterprise innovation [31], and the efficient use of employee advantages can significantly positively affect the scale of enterprise innovation [32]. The business's financial structure will affect its level of creativity from an organizational perspective [33]. And the deployment of time and time can reinvent academic management and encourage business innovation [34]. From the social level, the change in R&D efficiency can be explained by the shift in the corporate social system, especially in management innovation [35]. Leading R&D personnel and new R&D staff will perform more innovatively in different cultural contexts [36].

2.3. The Relationship between Business Environment and Enterprise Innovation Capability

The research on how the corporate environment affects an organization's capacity for innovation primarily focuses on the variations in research views. First and foremost, the financial climate will affect technical innovation, and financial restrictions may prevent a corporation from increasing its technological efficiency [37]. However, in the face of financing constraints, to avoid operational difficulties, enterprises will substitute the company's technical level through internal tapping [38]. Secondly, the government environment can have a significance on an organization's ability to innovate, the governance environment of the area in which the organization is based has a significant beneficial effect on the R&D activities of the organization, and government fiscal responsibility and tax incentives policies can effectively support the enhancement of an organization's creativity capacity [39]. Thirdly, the influence of the rule of law environment on enterprise R&D is controversial. Enterprise innovation can be effectively encouraged by safeguarding intellectual property that takes the perspective of the information spillover [11]. Still, the relationship with developing countries is insignificant [40], and even excessive intellectual property protection will hurt technological innovation [41]. Finally, the business environment as a whole is associated with technological progress. And the ability of cities to innovate is significantly enhanced by the business environment [24]. Improving the business environment contributes to better capital allocation of funding to innovative initiatives and better industry-specific innovation [42,43].

Based on the above literature, it can be found that despite the relatively substantial studies on the commercial climate and corporate innovation in the current papers. There are still some things that need to be improved. (1) The empirical research on the relation of the business environment on enterprise innovation only stays in a particular environment or several aspects of the business environment. This cannot comprehensively assess the business environment's influence on technological innovation. (2) Endogenous concerns have yet to receive sufficient consideration in several empirical investigations, resulting in low credibility of empirical conclusions. (3) At present, internal mechanisms that account for how the corporate environment affects company innovation fall short. Therefore, this paper establishes a comprehensive index of the business environment through the entropy method, creates a theoretical framework for the significance of the business environment on the capacity for company innovation, reveals the internal mechanism, selects instrumental variables, and analyzes the heterogeneity from three micro perspectives of enterprise property rights, business scope, and scale based on overcoming the endogenous.

3. Theoretical Analysis and Hypothesis

3.1. Direct Effects

Enterprises have different tangible and intangible resources that can be transformed into unique capabilities. Resources are illiquid and difficult to replicate between enterprises. These unique assets and talents give businesses long-term competitive advantages [44]. To achieve a successful competitive equilibrium, persons with information advantages

reliably communicate information to those with information disadvantages through "signal screening" and "signal transmission" [45]. On the one hand, the business environment has vital resource attributes, which can offer monetary assistance for business technology innovation, lower the risk associated with business technological innovation activities, and encourage businesses to engage in R&D innovation. As a signaling mechanism, the business environment, on the other hand, also contributes to expanding external financing sources, increasing company innovation efficiency, and attracting more external investment institutions to support innovation activities.

According to the Schumpeter innovation theory, implementing innovation requires a specific external economic environment [46]. As a critical focus of comprehensively deepening reform, optimizing the business environment means further improving the government services, human resources, financial background, public facilities, market environment, and innovation environment faced by enterprises. Firstly, improving government services can improve service efficiency, reduce institutional costs for enterprises, and eliminate rent-seeking behavior by optimizing the administrative climate [47]. On the other hand, financial and tax means can be used to subsidize enterprises' R&D to make up for the market failure of private R&D innovation, and thus improve enterprises' innovation ability [48]. Secondly, the optimization of human resources is manifested in an increase in the number and quality of talents, attracting talents with an open mindset, promoting the integration of industry, academia, and research between regions [49], improving production efficiency and factor quality, and ensuring the sustainable development of enterprise innovation [50]. Additionally, an improved financial system can rationally direct the flow of money and maximize the distribution of resources. Market transparency can lessen the knowledge imbalance in the demand and supply of money. The finance side can more quickly discover and promote innovative businesses by providing them with funding [51]. The financial strain businesses experience while engaging in innovation activities can then be reduced by enhancing public infrastructure, which also helps increase the "availability" of resources and draw in innovative elements [52], generating effects such as information sharing, knowledge spillover, and team learning to improve enterprise innovation performance [53]. Then, an open market environment can not only weaken the damage of political management to market competition, promote the effectiveness of market competition in stimulating innovation for enterprises [54], but also promote the efficiency of regional resource integration, drive coordinated innovation among enterprises, and improve innovation efficiency [55]. Finally, a good innovation environment can effectively integrate the resources required for creation, improve innovation input-output efficiency, and enhance enterprise innovation performance through the formation of innovation cooperation [56]. In summary, the business environment can be comprehensively optimized from the dimensions of ecosystem elements, thereby promoting the efficiency of enterprise innovation. The analysis mentioned above is used to support the following hypotheses.

H1: *The increase of an enterprise's capacity for innovation can be supported by improving the business environment.*

3.2. Intermediary Effect

Government subsidies are a form of free capital that directly affects the acquisition and allocation of innovation resources for enterprises, regulating and managing their innovation activities [57]. Optimizing the business environment includes standardized government subsidy guidelines [58]. Financial tools like innovation subsidies not only reduce the uncertainty risk of innovation activities but also affirms the research and development technology level of enterprise research projects. Moreover, the government engages in the relationship between businesses and investors as a third party. Additionally, it might lessen the information gap between companies and investors and increase investors' trust in the

enterprise. Therefore, a good business environment can optimize government subsidies. Government subsidies will give innovation more consideration [59].

Resources and the external environment are associated with an enterprise's capacity to tolerate risks, an essential component of business operations [60]. On the one hand, a favorable business climate can support the steady and orderly growth of the market, enhancing the transparency and openness of its prospects, which is conducive to enterprises grafting market resources and government resources, improving the level of enterprise risk-taking, reducing the risk of innovation failure, and thereby enhancing the willingness of enterprises to invest in scientific research [61]. On the other side, through the system, it can directly share the risk of enterprise innovation failure, increase the tolerance of enterprise innovation failure risk, motivate enterprises to engage in innovation activities, explore innovation markets, and expand competitive market advantages [62]. The analysis, as mentioned above, is used to support the following hypotheses.

H2: *The enhancement of business environment can optimize government subsidies, improve enterprise risk bearing capacity, and thus positively promote the improvement of enterprise innovation efficiency.*

3.3. Moderating Effect

Financing constraints are a key factor restricting enterprise innovation [63,64]. Markets needing more institutional guarantees will increase financing constraints. Company operators will tend to obtain stable returns and avoid taking on risks caused by innovation activities, thereby reducing investment in enterprise innovation [65]. A favorable business climate can completely exhibit accurate and comprehensive information about businesses in addition to lowering the level of disparity in details in the financial market, but also transmit positive signals, making external investors believe that the industry's enterprises have a "good prospect" and "good credit", which is conducive to enhancing the trust of external investors in enterprises and providing innovative resource support [66]. The economic climate can be improved to increase the likelihood of successful financing, decrease expenditures on capital, broaden financing channels, and encourage enterprises to invest more actively in research and development projects which support innovative products and services.

The supplier chain concentration ratio significantly affects how innovatively businesses operate. Excessive concentration of the supply chain will cause the profits of enterprises to be obtained by customers and suppliers with strong bargaining power, thus reducing the enthusiasm of enterprises for innovation [67]. On the one hand, a favorable business climate facilitates the transmission of information between businesses, makes the supply and demand market more open and effective, and solves problems such as information opacity and lengthy transaction chains in the supply chain, thereby reducing the dependence on enterprises on suppliers, enabling them to obtain more innovation resources and carry out continuous innovation [68]. On the other hand, it can facilitate cooperation between enterprises and customers in the form of more information, enable enterprises to carry out internetworking with customers and avoid the phenomenon of hindering enterprise innovation activities due to a high customer concentration ratio. The analysis, as mentioned above, is used to support the following hypotheses.

H3: *Enterprise financing constraints and supply chain concentration ratio can negatively regulate the promotion of business environment optimization on enterprise innovation capability.*

3.4. Heterogeneity

Due to individual development disparities, firms' innovation development levels vary in business activities. First, intellectual property is a crucial consideration for businesses while carrying out their operations, and it directly relates to how effectively they innovate. The creation of an equitable and open market, the reduction of ownership discrimination,

the end of state-owned enterprises' monopoly, and an increase in the need and enthusiasm for creativity have all resulted from a betterment of the business environment, which has also increased the effectiveness of enterprise innovation [69]. Secondly, different industries have varying degrees of dependence on the environment during their development process, and their willingness to conduct innovative research also varies [70], resulting in different innovation capabilities. For example, compared to traditional industries, knowledge, and technology-intensive industries face more innovative research and development decisions, more significant information asymmetry, and higher external uncertainty. Therefore, businesses in knowledge-intensive sectors will be more effective at innovating when the business environment is optimized [69]. Finally, the enterprise's scale will have some bearing on its capacity for innovation. The enterprise's ability to withstand risk is more substantial, and there is a greater chance that it will use its resources for frugal innovation and research, which is more supportive of the enterprise's level of innovation, depending on the size of the enterprise. Large-scale businesses are more likely than small and medium-sized businesses to have access to information resources and benefit from the "dividends" brought about by improving the business environment. This increases research output and strengthens the promoting effect of improving the business environment [71]. The analysis, as mentioned earlier, is used to support the following hypotheses.

H4: *Businesses with varied property rights, industries, and scales may experience different effects from the business environment on their capacity for innovation.*

Based on the resource signal theory and the Schumpeter innovation theory, this study develops a theoretical model of the business environment and enterprise innovation capabilities. It also discusses the differences in the heterogeneity of enterprise property rights, business scope, and scale in this relationship. Figure 1 shows the analysis framework.

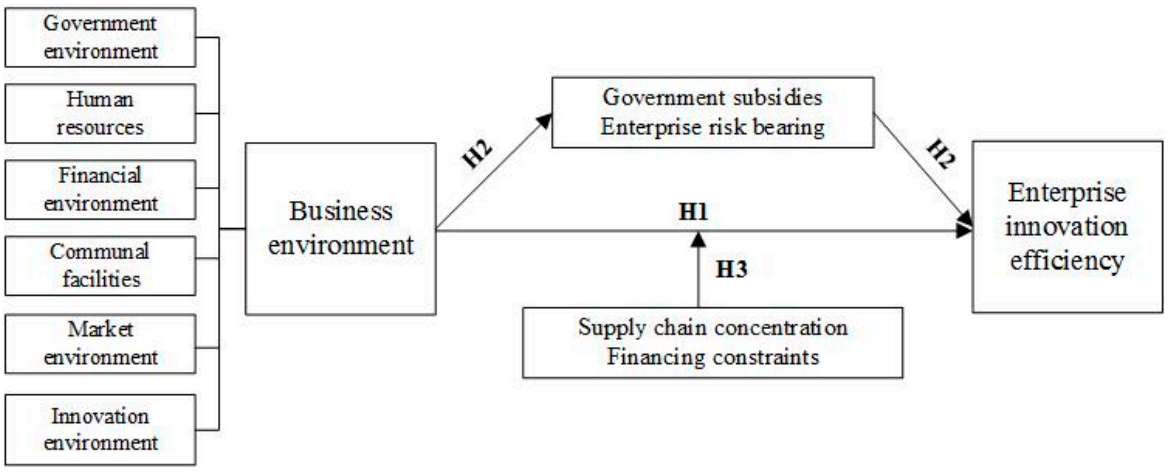

Figure 1. Research framework.

4. Research Design

4.1. Variable Selection and Measurement

4.1.1. Explained Variable

The enterprise innovation capability (lnno) is the variable being explained. There are two primary measurement techniques: (1) The number of business patent applications. (2) The number of new items created or enhanced by the business. This article uses the method from Lin et al. [72], and measures the innovation capacity of businesses through the calculation of the natural logarithm (lnno) of the total number of patent applications filed by the companies listed and their subsidiaries plus 1.

4.1.2. Explanatory Variables

The business environment (envir) is the explanatory variable. Based on the relevant World Bank indicators, local and foreign researchers have created a realistic indicators system for building a business climate evaluation indicator system. This paper adopts the six layers of the governmental surroundings, employee resources, monetary surroundings, public facilities, market environment, and innovation environment from the research group "China's Urban Business Environment Evaluation" [5] to evaluate the business environment at the urban level. Table 1 displays the specific measuring procedure. The study selects to use the entropy technique for calculating the business company climate index because the channel indicators within the initially-level indicators are without dimension. Each channel-item index includes various units corresponding to multiple meanings and can't be immediately calculated and compared. The precise computation procedure is listed below.

Table 1. Urban Business Environment Indicator System.

Level 1 Indicator	Level 2 Indicator	Description	Weight (%)	Attribute
Government environment	Political and commercial relations	Fiscal transparency	1.735	+
	Government expenditure	General budget expenditure	11.095	+
Human resources	Labor cost	Weighted average wage of employees	2.46	+
	Human resources reserve	Number of employees	7.331	+
Financial environment	Deposit level	Balance of deposits in financial institutions at the end of the year	13.109	+
	Loan level	Balance of loans from financial institutions at the end of the year	9.672	+
Communal facilities	Facility construction	Urban per capita area	20.786	+
	Medical conditions	Number of medical beds	5.387	+
Market environment	Economic indicators	Regional GDP per capita	5.984	+
	Enterprise organization	Number of industrial enterprises above designated size	6.801	+
Innovation environment	Scientific expenditure	Financial expenditure on science and technology	15.084	+
	Technological innovation	Urban innovation score	0.574	+

Step 1: Normalize each factor according to the quantity of each option. The formula for calculating the positive indicator is.

$$y_{ij} = \frac{x_{ij} - x_{i\max}}{x_{i\max} - x_{i\min}} \quad (1)$$

For reverse indicators, the calculation formula is.

$$y_{ij} = \frac{x_{i\max} - x_{ij}}{x_{i\max} - x_{i\min}} \quad (2)$$

wherein, x_{ij} represents the i indicator acquisition value of the indicator j city, i represents the indicator, j represents the city, $x_{i\max}$ represents the maximum value of the indicator, $x_{i\min}$ represents the minimum value of the indicator, and y_{ij} represents the i indicator utility value of the indicator j city.

Step 2: Determine the item's index's entropy value.

$$e_j = -\frac{1}{\ln n}\sum_{i=1}^{n} p_{ij}\ln(p_{ij}), j = 1, \ldots, m \quad (3)$$

Step 3: Calculate the difference in information entropy redundancy.

$$d_j = 1 - e_j, (j = 1, 2, \cdots, m) \quad (4)$$

Step 4: Determine each indicator's weight.

$$W_j = \frac{d_j}{\sum_{j=1}^{m} d_j}, (j = 1, 2, \cdots, m) \quad (5)$$

Step 5: Calculate the comprehensive score of each sample:

$$envir_i = \sum_{j=1}^{m} W_j Z_{ij}, (i = 1, 2, \cdots, n) \quad (6)$$

The business climate index is then discovered.

4.1.3. Intermediary Variables

Government subsidy (sub) refers to a way for the government to subsidize the operation and development of enterprises for free, mainly including financial discounts, policy subsidies, etc. The governmental policy system can be effectively improved, rising development companies receive more support, and monetary donations can be increased by optimizing the business environment [73]. This paper takes the government subsidies of listed companies as the variable to measure government support.

Enterprise risk-taking (rj) refers to identifying, grasping, and controlling risk opportunities, as well as buffering and covering risks. A key element in the creation and growth of businesses is the enhancement of risk-bearing capacity. The amount of innovation at which companies operate and usually develop is directly influenced by their financial situation [74]. The proportion of investments in fixed assets to operating income is used as an indicator in this study to assess an organization's ability to assume risk.

4.1.4. Moderating Variables

Financing constraints (*sa*) refer to enterprises' financial difficulties in obtaining capital for production and operation. The business environment lowers the knowledge asymmetry between businesses and the market for trading and can, to a certain extent, ease businesses' financing restrictions. There are numerous indications available right now to gauge limitations on enterprise finance. This study employs the SA index created by company age and business operation size as the variable to assess enterprise finance restrictions to account for data availability and completeness and to prevent endogenous issues.

Supply chain concentration (sc) refers to the business stability and scale between enterprises and upstream and downstream related industries. The supply chain relationship in the business environment can, on the one hand, provide new financing channels for enterprises and, on the other hand, bring essential tools and knowledge to the success of businesses [75]. The variable chosen in this study to assess the degree of supply chain concentration is an average of the percentages of the top five suppliers' and customers' total sales.

4.1.5. Control Variables

Due to the microcosmic character of the study object, this work chooses enterprise-level data as the control variable to limit the error of the research results caused by missing variables, as shown in Table 2.

Table 2. Control Variable definition.

Variable Name	Character	Variable Description
Asset-liability ratio	lev	The ratio of corporate liabilities to assets
Number of directors	bod	Number of directors
Share price level	stk	The ratio of annual stock value of enterprises to GDP
Business income	bi	Ratio of business income to GDP

4.1.6. Data Source

This study combines indicators of data defining the business climate at the city level with Chinese-listed businesses as the research object. It uses that information to create a set of panel data for 2013 to 2019. To avoid the impact of abnormal observation values, referring to previous research management, samples with abnormal operating conditions such as ST, * ST, PT, and missing data were excluded, and 15,438 annual observation values of enterprises were ultimately obtained. The China Urban Statistical Yearbook is where the regional economic data for the cities comes from. The missing year data is approximately supplemented and replaced with adjacent year data. Among them, the CNRDS database is where the regional financial data for the enterprises comes from. The primary variables' descriptive and statistical findings are displayed in Table 3.

Table 3. Descriptive statistics of variables.

Variable	Obs	Mean	Std.	dev.	Min
envir	15,438	0.230	0.181	0.0123	0.620
lev	15,438	0.418	0.622	0.0111	63.97
bod	15,438	10.13	2.691	4	27
stk	15,438	0.181	0.576	0.00101	19.40
bi	15,438	1.013	39.41	−4.640	4500
lninno	15,438	0.000471	0.0153	0	1
sub	15,438	4.960×10^7	2.340×10^8	-4.420×10^9	1.090×10^{10}
sc	15,438	30.67	16.95	0	100
sa	15,438	−3.776	0.253	−5.543	−2.113
rj	15,438	0.204	0.148	0.000159	0.876

4.2. Research Methods

A three-stage approach is presented in this article. The key effect is the first stage, which evaluates the extent to which the business atmosphere (envir) promotes enterprise innovation (lnno). In Formula (7), the model is displayed.

$$\ln no_{it} = \alpha_0 + \alpha_1 enivr_{it} + \sum_n \alpha_n control_{it} + \mu_i + \lambda_i + i.year + \omega_{it} \quad (7)$$

The subscript i represents the individual enterprise, t represents the time, μ_i represents the fixed effect of the individual enterprise, λ_i represents the time fixed effect, $\ln inno_{it}$ represents the logarithm of the enterprise's innovation ability, *enivr* represents the development level of the business environment, α_0 represents the intercept item, α_1 represents the coefficient of the business environment to the enterprise's innovation efficiency, n represents the serial number of the control variable, where α_n represents the coefficient of the control variable to the enterprise's innovation efficiency, *control* represents the control variable, and *i.year* represents the annual dummy variable, ω_{it} is a random perturbation term.

In the second stage, on the basis of the main effect, the following model is created to further investigate the function and mechanisms of intermediary factors in the commercial

environment and enterprise innovation efficiency. Subsidies from the government (sub) and enterprise risk taking (rj) are incorporated as intermediary variables.

$$sub_{it}(rj_{it}) = \beta_0 + \beta_1 enivr_{it} + \sum_n \beta_n control_{it} + \mu_i + \lambda_i + i.year + \omega_{it} \quad (8)$$

$$\ln no_{it} = \gamma_0 + \gamma_1 enivr_{it} + \gamma_2 sub_{it}(rj_{it}) + \sum_n \gamma_n control_{it} + \mu_i + \lambda_i + i.year + \omega_{it} \quad (9)$$

This paper focuses on the significance of the coefficients β_1, γ_1 and γ_2, β_1 indicates the coefficient of the impact of the business environment on the government subsidies (enterprise risk bearing capacity). Following the addition of intermediary factors, γ_1 shows the direct impact of the business environment on the enterprise's innovation ability, while γ_2 shows the indirect effect of the business environment on the company creativity capability.

Chain of supply concentration (sc) and financial restrictions (sa) are introduced as modifying factors in the third phase in order to assess the regulatory impact of their relationship on the degree of business environment improvement on the capacity for innovation of companies. In Formula (10), the representation of the model is displayed.

$$\ln no_{it} = \theta_0 + \theta_1 enivr_{it} + \theta_2 sa_{it}(sc_{it}) + \theta_3 envir_{it} \times sa_{it}(sc_{it}) + \sum_n \theta_n control_{it} + \mu_i + \lambda_i + i.year + \omega_{it} \quad (10)$$

In the equation, the letters θ_1 represent the direct effect of the company's environment and the enterprise's capacity for innovation after the change in the adjustment variable is added, θ_2 for the value of the coefficient of the influence of the adjusting variable on that capacity, and θ_3 for the interaction between the business environment's level of development and that capacity.

5. Empirical Analysis

5.1. Benchmark Regression Results

Table 4 displays the benchmark regression findings using the business's environment as the explanatory variable. The benchmark regression findings using company innovation efficiency as the explanatory variable are displayed in Column 1. The results demonstrate that the business environment has a considerably favorable relation to company innovation capabilities at a statistically significant level of 1%, with an effective coefficient of 0.790. The result of gradually implementing company-level control variables can be seen in columns (2) through (5). As observed, the significance level of the primary explaining variable, the business atmosphere, progressively rises and is notably positive once the control variable is added.

Table 4. Benchmark regression of the impact of business environment on enterprise innovation efficiency.

	(1)	(2)	(3)	(4)	(5)
	lnno	lnno	lnno	lnno	lnno
envir	0.790 ***	0.792 ***	0.815 ***	0.987 ***	0.987 ***
	(14.23)	(14.28)	(14.71)	(17.54)	(17.54)
lev		0.077 ***	0.066 ***	0.064 ***	0.064 ***
		(4.78)	(4.07)	(4.02)	(4.03)
bod			0.033 ***	0.030 ***	0.030 ***
			(8.94)	(8.11)	(8.15)
stk				0.257 ***	0.257 ***
				(14.54)	(14.53)
bi					−0.000
					(−1.52)
constant	1.177 ***	1.144 ***	0.806 ***	0.753 ***	0.752 ***
	(72.40)	(64.90)	(19.29)	(18.08)	(18.05)
N	15,438	15,438	15,438	15,438	15,438
r^2	0.013	0.014	0.019	0.033	0.033

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** is significant at the statistical level of 1% respectively.

The influence of the advantage-liability ratio on firm innovation efficiency is notably beneficial at the statistical level of 1%, as shown by the estimated findings of controlling variables in Table 4. This demonstrates that a company's capital investment increases as its asset-to-liability ratio increases. Businesses will raise their R&D spending and innovation productivity to generate more significant revenues. At a statistical threshold of 1%, the amount of board of directors considerably influences an organization's capacity for innovation, suggesting that growth in the total number of companies of directors will help organizations become more innovative. The size and perfection of the business structure are inversely correlated with the size of the governing body of directors. To enhance market competitiveness, enterprises can improve their scientific research level. At the 1% statistical level, the effect of share price level on business innovation effectiveness is significantly positive. The higher the stock price level, the more non-innovation income enterprises can obtain. Enterprises will use the increased income for innovation activities and increase investment in R&D resources. The benefits of an organization's technology investment increase with the expenditures invested in innovation. The anticipated outcomes of the control factors are generally in line with predictions.

Even if different businesses' innovation ability becomes more effective with time, change trends and timing vary. Discussing individual and time differences in enterprise innovation capabilities can help better explore the impact of the business environment on enterprise innovation efficiency. The logistic regression test is consequently conducted in this article using the fixed-effects model, and the findings are displayed in Table 5. According to column (1)'s findings, the business environment has a statistically significant beneficial effect on a company's capacity for creativity at a threshold of 1%, and the resultant coefficient is 2.608. According to column (2), the company's capacity for innovation is significantly positively associated with the business environment at the 1% statistical level using the moment-fixed effect model, with a relation coefficient of 0.885. According to column (3), the company innovation capability is positively affected by the business environment at the 1% statistical threshold, with an influence coefficient of 0.659, using the individual and temporal double fixed effects model. It is evident that the business environment, regardless of the methodology employed, significantly improves the innovation effectiveness of firms at the level of 1%. H1 is confirmed.

Table 5. Fixed Effect Regression of the Impact of Business Environment on Enterprise Innovation Efficiency.

	(1)	(2)	(3)
	lnno	lnno	lnno
envir	2.608 ***	0.885 ***	0.659 ***
	(23.65)	(15.32)	(4.24)
lev	0.011	0.068 ***	0.011
	(0.84)	(4.23)	(0.80)
bod	0.002	0.032 ***	0.004
	(0.58)	(8.68)	(1.36)
stk	0.117 ***	0.250 ***	0.057 **
	(5.00)	(14.19)	(2.47)
bi	−0.000	−0.000	−0.000
	(−0.79)	(−1.42)	(−0.87)
constant	0.715 ***	0.756 ***	0.823 ***
	(17.63)	(18.21)	(19.28)
N	15,438	15,438	15,438
r^2	0.046	0.030	0.099

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** and ** are significant at the statistical level of 1% and 5% respectively.

5.2. Robustness Test and Endogenous Treatment

5.2.1. Replace the Interpreted Variable

In this study, the explained variables have been switched out, and the validity of the standard regression findings is tested. According to Xiaofei Chen's representation method, the input indicators used in data envelopment analysis (DEA) to assess an enterprise's capacity for innovation include ① R&D personnel input select the ratio of the number of R&D personnel to the number of employees. ② R&D investment select the proportion of R&D investment in operating income. ③ Capitalized R&D investment select the proportion of capitalized R&D investment (expenditure) in R&D investment. Output indicators include ① Patent output expressed by selecting the number of utility patents. ② Invention output represented by the number of invention patents. ③ Revenue level represented by the proportion of operating revenue to assets. Column (1) of Table 6 displays the test results. At 1%, the business environment considerably benefits the number of patents awarded by businesses. As a result, the main finding will not be significantly changed as a result of the modification in innovation measuring.

Table 6. Results of robustness test.

	(1)	(2)	(3)	(4)
	lninno	lnno_tr	lnno	lnno
envir	0.002 **		0.760 ***	0.987 ***
	(2.99)		(7.16)	(17.54)
envir_tr		0.800 ***		
		(11.02)		
constant	−0.000	0.668 ***	0.558 ***	0.752 ***
	(−0.92)	(11.39)	(7.33)	(18.05)
controls	yes	yes	yes	yes
years	yes	yes	yes	yes
code	yes	yes	yes	yes
N	15,438	9346	15,438	15,438
r^2	0.003	0.029		

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** and ** are significant at the statistical level of 1% and 5% respectively.

5.2.2. Data Tail Reduction Processing

The study conducts additional tests for every single variable after data smoothness (Winsor) of roughly 5% to remove the influence of outliers and retain the accuracy of sample data. The anticipated findings are displayed in Table 6's column (2). Even today, businesses can be adequately motivated to engage in innovative activities by optimizing the company's environment. This proves the dependability of the standard regression findings by showing that outliers do not affect the main conclusions.

5.2.3. Replacement Estimation Method

Considering data characteristics, the business environment and the efficiency of enterprise innovation may be censored, which may lead to data interception. According to column (3) in Table 5, the Logit model is the testing method used in this article. The Tobit model has been used for re-inspection, as seen in column (4) of Table 6. The findings demonstrate that the corporate atmosphere continues to have a crucial influence in fostering firms' capacity for innovation. This indicates that the significance of core explanatory variables has remained unchanged due to different estimation methods.

5.2.4. Endogenous Treatment

The business atmosphere and an organization's capacity for innovation may be causally linked in a two-way fashion, which could result in internal issues. Referring to the method of Lewbel [76], this paper uses the third power of the difference between the business environment index and its average value (d_envir) as the instrument variable to conduct the endogenous test. The results are shown in Table 7. The least squares method is used for estimation. Column (1) shows the estimation results of the first stage. The results show that the coefficient of the instrument variable is significantly positive at the statistical level of 1%, which indicates that the business environment and the instrument variable are highly correlated. In addition, the F value of the first stage is greater than the critical value of 10. There is no weak instrumental variable problem. Column (2) shows the results of the second stage. The results show that the business environment is significantly positive for the innovation efficiency of enterprises at the statistical level of 1%, which indicates that the optimization of the business environment has a positive and significant role in promoting the innovation ability of enterprises. For robustness, this paper also uses GMM and LIML estimation methods. The results are shown in columns (3) and (4). The standard regression results are consistent with the influence of the business climate on company innovation efficiency being substantially beneficial at the statistical level of 1%, demonstrating the validity of this study's conclusions.

Table 7. Endogenous Test Results.

	(1)	(2)	(3)	(4)
	lnno	lnno	lnno	lnno
envir		0.733 ***	0.733 ***	0.733 ***
		(6.92)	(6.92)	(6.92)
d_envir	4.848 ***			
	(7.21)			
constant	0.979 ***	0.819 ***	0.819 ***	0.819 ***
	(24.77)	(15.76)	(15.76)	(15.76)
controls	yes	yes	yes	yes
years	yes	yes	yes	yes
code	yes	yes	yes	yes
N	15,437	15,437	15,437	15,437
r^2	0.017	0.032	0.032	0.032

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** is significant at the statistical level of 1% respectively.

5.3. Intermediary Effect

5.3.1. Government Subsidies

Government subsidies are affected by changes in the business environment, reflecting policy incentives in fiscal expenditure, which can enable enterprises to retain more available resources. It has significance on how effectively innovation in enterprises works. This paper tests the intermediary effect of government subsidies by constructing an intermediary effect model. The results, as estimated, are displayed in Table 8. According to Column 1, which is consistent with the findings of the standard regression analysis, the business environment has an important influence on company innovation effectiveness at the statistical level of 1%. The effect of the business climate on subsidies from the government is shown in column (2). According to the calculated findings, the business atmosphere has a strong positive impact on contributions from the government at the 1% statistical level, meaning that improving the business environment will result in higher government assistance. Column (3) demonstrates that at the statistical level of 1%, the effect of government subsidies on company efficiency when it comes to innovation is exceptionally favorable. Government grants, therefore, act as a mediator between the commercial climate and entrepreneurial, creative capacity. Based on the consideration of robustness, the Sobel test is further carried out in this paper, and p values are significant at the statistical level of 1%. The findings once again confirmed the intermediary influence associated with government subsidies, showing that the business environment could enhance enterprises' capacity for innovation by increasing contributions from the government. The direct relation of the business environment on company innovation effectiveness is 0.122, and its indirect relation is 0.139. H_2 is confirmed.

5.3.2. Enterprise Risk-Bearing Capacity

An essential resource within the company in the structure of the business atmosphere affecting firm innovation capacity is enterprise risk-bearing ability. This article examines the intermediary role of enterprise risk-bearing capacity. The findings of column (4) demonstrate that the percentage of fixed assets held by businesses is notably negatively related to the business environment at the statistical level of 1%. The business environment is optimized, which lowers the amount of fixed-income assets held by businesses and increases their ability to take on risk. Column (5) demonstrates that, at a statistically significant level of 1%, the percentage of fixed assets in a company significantly adversely affects a company's capacity to innovate. In other words, the more analytically capable an enterprise is, the lower its fixed asset percentage will be, and vice versa. As a result, between the company's operational environment and an organization's ability for innovation, its risk-bearing capacity serves as a bridge. The Sobel test is additionally performed in this study based on the robustness factor, and the results for P are considered statistically significant at the 5% statistical level. The direct effect of the business environment on enterprise innovation efficiency is 0.03, and the indirect effect is 0.03. The results again verified the intermediary product of the enterprise's risk-bearing capacity. H_2 is confirmed.

Table 8. Estimated results of intermediary effect.

	(1)	(2)	(3)	(4)	(5)
	lnno	sub	lnno	rj	lnno
envir	0.987 ***	1.229×10^8 ***		−0.168 ***	
	(17.54)	(11.73)		(−25.73)	
sub			0.000 ***		
			(24.41)		
rj					−0.411 ***
					(−6.00)
constant	0.752 ***	-5.830×10^7 ***	1.040 ***	0.189 ***	1.072 ***
	(18.05)	(−7.52)	(26.97)	(39.02)	(26.51)
controls	yes	yes	yes	yes	yes
years	yes	yes	yes	yes	yes
code	yes	yes	yes	yes	yes
Sobel			0.120 ***		0.030 **
			(10.45)		(2.53)
Indirect			0.139		0.03
Direct			0.122		0.03
N	15,438	15,437	154,37	15,437	15,437
r^2	0.033	0.035	0.050	0.058	0.016

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** and ** are significant at the statistical level of 1% and 5% respectively.

5.4. Moderating Effect

5.4.1. Financing Constraints

The business environment primarily impacts businesses' production and operation efficiency throughout their manufacturing and management activities. The "sa" index is typically used to illustrate financial restrictions. The size of the funding limitations decreases with increasing "sa" index. According to the theoretical study, businesses will employ market forces and the government's funding for technological innovation more effectively if the business environment is optimized. The following piece will examine how financial restrictions have an association with regulations. Table 9 presents the results of the study. The standard regression results are shown in column (1), and column (2) demonstrates that, at the statistical level of 1%, the influence of the sa index on company innovation effectiveness is significantly positive. In other words, the company's innovation efficiency increases as the enterprise funding restriction decreases. Based on this, add the dynamic phrase of the company's climate and sa index. The conclusions are displayed in column (3). At a significant level of 1%, the collective term environment * sa has an advantageous effect on the innovation effectiveness of businesses. The influence coefficient of the business environment on the innovation effectiveness of companies has risen substantially, suggesting that the negative regulation of financing for businesses restraints the encouragement of business surroundings on the enterprise's innovation capacity. This supports H_3.

Table 9. Estimated results of regulatory effect.

	(1)	(2)	(3)	(4)	(5)
	lnno	lnno	lnno	lnno	lnno
envir	0.987 ***	0.942 ***	10.002 ***	0.991 ***	1.428 ***
	(17.54)	(16.72)	(13.14)	(17.74)	(12.78)
sa		0.365 ***	−0.297 ***		
		(9.26)	(−4.37)		
envir × sa			2.406 ***		
			(11.93)		
sc				−0.009 ***	−0.005 ***
				(−15.13)	(−5.77)
envir × sc					−0.014 ***
					(−4.51)
constant	0.752 ***	2.130 ***	−0.375	1.064 ***	0.964 ***
	(18.05)	(13.78)	(−1.44)	(23.02)	(18.83)
controls	yes	yes	yes	yes	yes
years	yes	yes	yes	yes	yes
code	yes	yes	yes	yes	yes
N	15,438	15,437	15,437	15,437	15,437
r^2	0.033	0.038	0.047	0.047	0.048

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** is significant at the statistical level of 1% respectively.

5.4.2. Supply Chain Concentration

Supply chain concentration is a critical environmental resource in the business environment influencing enterprise innovation capabilities. The paper in question investigates how supply-chain specialization affects regulation. Column (4) demonstrates that, at a statistical level of 1%, the influence of supply chain specialization on enterprise innovation effectiveness is statistically significantly negative. On this basis, add the interactive item of the business environment and supply chain concentration. The result is shown in column (5). The influence coefficient of the business surroundings on the innovation effectiveness of enterprises has risen substantially, and the interactive item environment * sc has hurt enterprises' ability to innovate at a significant level of 1%. This shows that improving the supply chain's concentration harms promoting the business environment's ability to foster innovation in enterprises. This supports H_3.

5.5. Heterogeneity Testing

5.5.1. Group Inspection of Property Heterogeneity

This article splits the companies into four groups based on the fundamental control rights of the businesses: state-owned businesses, private businesses, businesses with foreign funding, and other businesses to estimate. The test results are shown in Table 10. The business climate has a significant positive influence on the ability of government-owned and private companies to innovate at the level of 1%; however, the influence on businesses with foreign funding has a significant positive effect at 5%. However, there are differences in the coefficient. The percentage that is made up of state-owned companies is comparatively high. The "ownership discrimination" that affects businesses' innovation efforts could be the cause. The state-owned enterprises have sufficient human resource reserves, capital, and scientific research strength. They can play the business environment's driving role in enterprises' innovation ability [77]. The grouping test of property rights provides evidence for enterprise reform. By reforming state-owned businesses, we can further boost these companies' creativity and entrepreneurial vitality. On the opposing end of the spectrum, we can provide more non-state-owned businesses with policy guidance, encourage them to make wise investments, use less foreign capital, and increase their enthusiasm for innovation.

Table 10. Group estimation results of property rights.

	State-Owned Enterprise	Private Enterprise	Foreign Enterprise	Other Enterprises
	lnno	lnno	lnno	lnno
envir	1.698 ***	0.687 ***	0.701 **	0.496
	(15.00)	(10.41)	(3.20)	(0.85)
constant	0.633 ***	0.905 ***	0.801 ***	1.203 **
	(6.45)	(18.06)	(4.69)	(3.00)
controls	yes	yes	yes	yes
years	yes	yes	yes	yes
code	yes	yes	yes	yes
N	4619	9845	829	145
r^2	0.066	0.018	0.026	0.235

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** and ** are significant at the statistical level of 1% and 5% respectively.

5.5.2. Business Scope Grouping Inspection

Based on the industry classification of the national economy in 2017, this paper further classifies the industries. The manufacturing industry is a group, Service industry (Including wholesale and retail sectors. Transportation, warehousing, and postal services. Accommodation and catering industry. Information transmission, software, and information technology services. Financial industry. Real estate industry. Leasing and business services. Scientific research and technical assistance. Water conservancy, environment, and public facilities management. Resident Services, repair, and other services. Education. Health and social work. Culture, sports, and entertainment. General management, social security, and society Organization) are a group, and the rest industries are a group.

The regression results are shown in Table 11. The results show that in manufacturing, service. At a statistical threshold of 1%, the business environment has a considerably favorable influence on company innovation capability in these and other industries. This finding suggests that enhancing the business climate can significantly boost the efficiency of company creativity. However, there are differences in the coefficients, possibly due to the circular accumulation effect of enterprise innovation. Factor resources will affect enterprise innovation. Compared with other industries, the manufacturing industry has stronger resource dependence and is more vulnerable to the relation of resource allocation. At a statistical threshold of 1%, the business environment has a statistically significant positive effect on an organization's capacity for innovation. This finding suggests that enhancing the business climate can significantly boost an organization's capacity for innovation.

Table 11. Estimated results of business scope grouping.

	Manufacturing Industry	Service Industry	Other Industries
	lnno	lnno	lnno
envir	1.354 ***	0.703 ***	2.843 ***
	(19.44)	(6.66)	(15.00)
constant	0.628 ***	0.550 ***	−0.449 **
	(12.71)	(6.44)	(−2.61)
controls	yes	yes	yes
years	yes	yes	yes
code	yes	yes	yes
N	11,272	3085	1081
r^2	0.050	0.016	0.262

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** and ** are significant at the statistical level of 1% and 5% respectively.

5.5.3. Group Inspection of Enterprise Scale

Based on whether the number of employees is more significant than 2000, this article divides enterprises into two groups of samples, namely, small and medium-sized enterprises and large-scale enterprises. The estimated results of grouping are shown in Table 12. Under the statistical significance level threshold of 1%, the business environment substantially affects how innovatively efficient businesses are. But it has a more significant role in promoting large-scale enterprises. The possible reason is that the innovation activities of enterprises need a lot of scientific research and capital advantages. Large-scale enterprises have more resources and can make continuous resource investments for innovation activities, which can better promote the improvement of innovation ability.

Table 12. Estimated results of enterprise size grouping.

	Small and Medium-Sized Enterprises	**Large-Scale Enterprises**
	lnno	lnno
envir	0.801 ***	2.277 ***
	(13.82)	(15.68)
constant	0.771 ***	0.594 ***
	(17.73)	(5.33)
controls	yes	yes
years	yes	yes
code	yes	yes
N	11,814	3624
r^2	0.021	0.096

Note: The values in brackets are t values, and the standard deviation is the cluster robust standard error. *** is significant at the statistical level of 1% respectively.

6. Discussion

Exploring the corporate environment and the effectiveness of enterprise innovation remains an issue of concern in the academic world. This paper performs extensive research on the connection between the business climate and the company's innovation capability, ingeniously developing a straightforward explanation of the influence mechanism of the business climate on enterprise innovation potential and adding to the knowledge already known in the field.

This study employed the entropy approach to thoroughly assess the growth of the urban business environment by selecting micro-company data from Chinese public businesses. The relationship between the business climate and enterprise innovation capability was empirically analyzed. The findings revealed a statistically significant positive association between both of them, which is similar to Muhamad, Syamsul, Idqan and Budi [48]'s research findings. It is worth mentioning that existing research primarily focuses on enterprise innovation in specific industries [18], or innovation in specific economies [39], and the research period is relatively short, controlled within three years [39,78]. The innovative selection indicators in this article, on the one hand, implement research on innovation at the micro level of enterprises and expand the scope of enterprises, making the data more representative; on the other hand, the research period will be determined as 2013–2017, with a more extended period, and the optimization of the business environment will have a more significant effect on enterprise innovation. Specifically, the essence of business environment participation in promoting the efficiency of enterprise entrepreneurship is to promote the coordination and progress of various environmental aspects, optimize the complex socio-economic system, and thus improve innovation efficiency [79]. According to the comprehensive index system, the economic environment and public amenities have the most effects on business efficiency. Businesses pay greater attention to their financial situation during the innovation and study, and development processes [66], and the economic environment may be made better, which can lessen information asymmetry and properly direct the flow of money [51]. Enhancing public infrastructure can increase

resources' "availability" and lessen the pricing pressure that businesses experience while engaging in innovative activities [52]. As a result, these two factors might significantly affect an enterprise's innovation capacity. This conclusion helps entrepreneurs pay more careful consideration to the growth state of urban business environments when choosing business locations and provide critical theoretical backing for the government's enactment of regulations that enhance the business environment [80].

By enhancing government support and businesses' ability to take on risk, the business climate supports companies' creativity and growth capacities. Improving the business climate may standardize government subsidy policies, allowing subsidies to benchmark businesses appropriately and directly impact the allocation of resources [59]. A favorable business climate might encourage organizations to participate in innovative activities by enabling institutions to share the risk of creativity failure among businesses. This claim has been verified by the study conducted by Chen, Li and Xin [62]. It is important to note that government grants have a more significant effect to take on risk. Government subsidies have a direct association with enterprise innovation [57]. Enhancing enterprise risk-taking ability will first alleviate financial difficulties and then improve enterprise innovation ability [81], which has a particular buffering effect and a weak effect.

Compared with Zhiyuan and Zenglian [37] and Nannan, Dengfeng and Yin [78] focused the mechanism analysis on mediating effects and heterogeneity analysis. This paper explores the impact mechanism of the business environment on enterprise innovation, innovatively proposes that there is a moderating effect between the two, further improves the analysis mechanism, and enriches the existing literature. Financing restrictions and the chain of supply concentration ratio hurt how innovative an organization may be. Increasing financing probability, lowering capital expenses, and fostering product innovation for businesses are possible [82]. Lowering the supply chain's concentration ratio can stop customers and manufacturers from obtaining company profits through concentrated geographic locations and strong bargaining power. A favorable business climate can increase the passion for innovation. According to Jingbei, Naiding, Yanlu and Yue [56], the inverse U-shaped partially supports the thesis of this paper. One explanation could be that Internet technology has advanced. The supply chain's concentration ratio is low [68], which is in a U-shaped negative correlation stage.

Compared with Nannan, Dengfeng and Yin [78] and Ce, Chao, Qiwei and Xiaole [24], which focused on grouping heterogeneity at the macro level, this article innovatively implemented all research on heterogeneity grouping at the micro level of enterprises, making the study results more representative at the micro level. Specifically, the impact of the business environment on the innovation ability of enterprises varies in degree. First, state-owned firms are most affected by improving the business environment. State-owned businesses are more inclined to enhance their innovation capacities in an optimized business environment, reducing ownership discrimination to preserve their monopoly position. This aligns with the findings of Zhang, Yu and Chen [33]. Second, manufacturing companies are more affected by improving the business environment than service companies. Businesses engaged in manufacturing are more reliant on the environment and more eager to engage in innovative research with appropriate governmental backing. Wang et al. [83] verified this conclusion. Lastly, large-scale firms are the ones most affected by business climate enhancement. Large-scale businesses are more likely to benefit from the "dividends" provided by the business environment's optimization. The likelihood of employing resources for innovation and research in science increases with risk tolerance. This aligns with the study's Baumann and Kritikos [71] findings.

Overall, the model constructed in this article verifies that the business environment can improve the innovation ability of enterprises from multiple aspects, further improving the theoretical analysis framework of the business environment and enterprise innovation efficiency. Helping to provide suggestions for optimizing the business environment: On the one hand, the government should formulate policy measures from a macro perspective, pay more attention to the adaptability of micro-enterprises, and provide more precise

suggestions for improving the innovation efficiency of enterprises [84]. On the other hand, due to differences in resource endowments, economic infrastructure, and technological foundations, enterprises should implement differentiated development strategies [84].

7. Conclusions and Policy Recommendations

7.1. Conclusions

This article is based on the indicator system of the "Research on the Evaluation of Urban Business Environment in China" research group, selects micro-enterprise data of Chinese listed companies, constructs a comprehensive business environment index through the entropy method, empirically analyzes the impact of business environment on enterprise innovation ability, and constructs a theoretical framework for further analyzing its impact mechanism. The main research conclusions are as follows. Firstly, there is a significant positive correlation between the business environment and the innovation capability of enterprises. The business environment is an essential soft power for a region or country. A good business environment can create a fairer market, facilitate the flexibility of enterprise operations, and promote technological innovation for enterprises. Secondly, the mechanism analysis shows that optimizing the business environment can improve the innovation efficiency of enterprises by increasing government subsidies and enhancing enterprises' Assumption of risk ability while reducing supply chain concentration and financing constraints can strengthen the promotion of the business environment on enterprises' innovation ability. Finally, heterogeneity analysis indicates that with the increase in market competition, the business environment is more conducive to stimulating the enthusiasm and motivation of state-owned enterprises for technological innovation to maintain a dominant position. A good business environment has a more significant impact on large-scale than small-scale enterprises. The development of the business environment between industries is imbalanced, and the business environment of the manufacturing industry needs to be further optimized to provide the inexhaustible impetus for local enterprises' technological innovation.

The research in this article has specific theoretical significance and practical value. Firstly, a comprehensive evaluation of the business environment has been conducted, providing a new perspective for optimizing the business environment. The second is to study the business environment paths that affect enterprise innovation from a micro-enterprise perspective, which enriches existing research and has particular theoretical significance. Thirdly, in the context of sustainable development, research has vital temporal relevance for achieving sustainable development of enterprises.

7.2. Suggestions

The policy recommendations for the research conclusion are as follows: Firstly, according to the optimization of the business environment, it can promote the improvement of enterprises' innovation ability, and the government can allocate resources through streamlining administration, delegating powers, and the market, which can not only reduce government corruption and rent-seeking behavior of enterprises, enable enterprises to spend more time in productive activities [8], but also attract talents, funds, and projects to gather in cities [85]. To some extent, it will form fierce market competition, forcing inefficient and inefficient enterprises to withdraw from the market gradually and forcing enterprises to invest more resources in research and development to improve product differentiation and competitiveness and maximize profits. Secondly, considering the intermediary effect between the business environment and the innovation ability of enterprises, the government can further improve the infrastructure environment and the market environment, attract more external investment [86], thus broaden the channels for enterprises to obtain funds, ease their financing constraints, reduce the tax burden and credit costs [87], have more idle capital for enterprise innovation, and improve innovation efficiency. At the same time, it provides more convenient government service policy protection, reduces institutional costs [23], further enhances the risk-bearing capacity of enterprises, and en-

ables enterprises to carry out scientific and technological innovation in a stable operating environment. Finally, the government regulatory authorities should carry out business environment optimization work following local conditions, significantly increasing efforts to optimize the business environment in areas where state-owned enterprises, large-scale enterprises, and manufacturing enterprises are located. To promote the comprehensive and sustainable development of enterprises, thereby better driving the sustainable development of the regional economy.

7.3. Limitations, and Prospects

This paper still has the following limitations: First, due to the limited ability of scholars and the lack of Data deficiency, the selection of business environment indicators could be better. Some objective factors will still affect the business environment, such as the openness of judicial information, social security satisfaction, etc. The measurement of variables will impact the research results and provide a specific space for future research. Secondly, this article only involves Chinese enterprises and does not involve foreign enterprises. The impact of the business environment in other countries on the innovation ability of enterprises, as well as the comparison of this impact between countries at different levels of development, is also a topic worth studying. Therefore, future research will further continue and enrich the evaluation of the business environment, enabling it to measure the level of the urban business environment more comprehensively and accurately to obtain more accurate conclusions.

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