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Scientific and Social Research

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Impacts, Risks, and Countermeasures of Building a Digital Government on Optimizing the Business Environment

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Abstract: Optimizing the business environment is a new strategy for economic development which is placed by the Party Central Committee, and optimizing the business environment to improve the quality of economic development has gradually become an important task of the government. The construction of digital government is an important factor which is involved in the optimizing process, additionally has a significant impact on it. Therefore, it is essential to explore the impact, risks, and countermeasures of the construction of digital government in term of business environment optimizing.

Keywords: Digital government; Doing business; Digital governance theory

Online publication: July 14, 2022

1. Introduction

The Party Central Committee and the State Council have been promulgating policies to encourage and to support the optimization of the business environment. The ‘Decision of the CPC Central Committee on Several Major Issues of Comprehensively Deepening Reform,’ was adopted on November 12, 2013, proposed the goal of establishing fair, open, and transparent market rules and building a business environment based on the rule of law. Notice on ‘Focusing on Enterprise Concerns to Further Promote the Implementation of Policies to Optimize the Business Environment,’ was further released on November 8, 2018, suggesting improvements to address problems in small and micro enterprises, local regulation, and policy formulation, in an effort to make the business environment more market-oriented, follow the rule of law, and internationalized. In addition, the ‘Regulations on Optimizing the Business Environment’ was released on October 23, 2019, as China’s first administrative regulations on optimizing the business environment, elevates proven experience and policies to the institutional level, creating a continuous atmosphere for the whole society to optimize the business environment. On November 25, 2021, the ‘Opinions on Launching Pilot Work on Business Environment Innovation’ was released, proposing one hundred and one reform initiatives in ten areas, and six pilot cities including Beijing, Shanghai, Chongqing, Hangzhou, Guangzhou, and Shenzhen were selected for business environment innovation, in an attempt to accelerate the international convergence and to continuously optimize the international business environment. After a series of construction and efforts, the ‘World Bank’s Doing Business 2020 Report’ shows China’s overall ranking of 31st, increased 15 places compared to the previous year. For two consecutive years, China has been ranked as one of the top 10 economies in the world with the greatest improvement in business progression.

Meanwhile, digitalization is rapidly on the rise. Based on the report released by the Organization of Economic Co-operation and Development (OECD), digitalization is as an integral part of globalization, and it has become an increasingly global phenomenon ^[1]. On May 13, 2020, 145 organizations launched the Digital Transformation Partnership Initiative (2020, Partnership Initiative), where the aims of the initiative are to promote inclusive services through the formation of multi-party cooperation, and eventually cultivate a new digital economy. The ‘Outline of the 14th Five-Year Plan of the National Economic and Social Development of the People’s Republic of China and Vision 2035,’ adopted on March 11, 2021 contain the theme of ‘Accelerating Digital Development and Building Digital China’ in its fifth chapter, showing the complete system of 3+1 in building digital China. In short, digitalization is important for the national development.

2. The impact of building a digital government on optimizing the business environment

Optimizing the business environment is a key indicator to assess the performance of digital government, therefore the construction of digital government is also a key factor to optimize the business environment. The business environment refers to the various institutional influences and requirements which are involved in the market economic activities, from market entry to market exit, including marketing, policy, legal system, business operation, human, and natural environment ^[2]. The most commonly used business environment assessment system today is the twelve environmental assessment indices which are established by the World Bank ^[3] (**Table 1**).

Table 1. World bank doing business indicator system

Primary indicators	Secondary indicators
Business start-up	Procedures, time, cost, paid-up capital baseline indicators
Construction permit processing	Procedures, time, cost, construction quality indicators
Access to electricity supply	Procedures, time, cost, reliability of electricity supply, transparency of electricity tariffs
Property registration	Procedures, time, cost, land management indicators
Credit access	Credit status indicators, legal rights indicators, credit registry and credit bureau coverage indicators
Small and medium-sized investor protection	Small and medium-sized investor protection indicators, shareholder governance transparency indicators, dispute mediation effectiveness indicators
Tax payment	Procedures, time, cost, frequency of tax payment, total tax rate, post-taxation procedures indicators
Cross-border trade	Time and cost for import and export documents and border compliance
Contract enforcement	Time, cost, quality indicators of judicial procedures
Bankruptcy processing	Time, cost, results, recovery rate, bankruptcy degree indicators
Government procurement	Procedures, time, cost, results

Source: Based on the World Bank Doing Business report. Because the World Bank does not use the statistical indicator “labor market regulation” in its Doing Business rankings, this indicator is not included in the table.

As shown in **Table 1**, these twelve indicators which are; (1) Business start-up; (2) Construction permit processing; (3) Access to electricity supply; (4) Property registration; (5) Access to credit; (6) Small and medium-sized investor protection; (7) Taxation; (8) Cross-border trade; (9) Contract enforcement; (10) Bankruptcy processing; (11) Labor market regulation; and (12) Government procurement. Each of these indicators has a secondary indicator, which the World Bank uses to measure the business environment of each country ^[4]. Similarly, the construction of digital government can also find its footing in the indicators as described below.

Firstly, promote open sharing technology to public data: The key to build a digital government is to ensure that public data is open and shared with relevant departments in a timely and effective manner, so that the data and information can circulate among different departments after breaking through the information barriers ^[5]. Further, the addition of public data to the public service system will provide convenience for the government's regulatory work.

Secondly, deepen the technology of sharing government information: An important part of digital government construction is to optimize the process of digitalization. Through artificial intelligence (AI) and other technical means, a mechanism for cooperation in the whole process of each department can be constructed ^[6], the process optimization of online and offline business processing can be achieved, and short time and efficiency in improvement can be obtained.

Thirdly, enhance the ability to collect law enforcement evidence accurately: The evidence collection ability of law enforcement departments is crucial to the digital construction of the government. Using big data analysis and other technologies to improve the collection of information of relevant enterprises by law enforcement departments can help the law enforcement departments to accurately and effectively combat enterprises with externalities and minimize the tragedy of the commons, indirectly optimize the business environment ^[7].

3. The risk of building a digital government to optimize the business environment

The primary task of building a digital government is to develop a model for speaking, making decisions, managing, and innovating with data, which requires the extensive use of digital technologies. However, any technology will have both advantages and disadvantages, and digital technology also has its own risks, which are reflected in the process of optimizing the business environment, and to a large extent the rule of law risks that need to be prevented and solved ^[8]. Below are few of the disadvantage of digital technologies.

Firstly, data collection can leak the corporate secrets: The process of building a digital government requires collection of a large amount of data and information, which is conducive to timely disclosure of information from government departments and enterprises to enhance the openness and transparency of their own governance ^[9], meanwhile the disclosure data can also increase the difficulty of information protection, which can easily cause confidential leaks.

Secondly, the digital divide increases the burden on enterprises: The digital divide, is a trend where the difference in the digital globalization process is increasing due to the different levels of information and information technology mastery by society, enterprises, and other subjects ^[10]. It is often reflected in the daily life of the elderly, and micro and small enterprises, and other disadvantaged groups which are unable to enjoy the convenience of digitalization ^[11]. Similarly, for many micro and small enterprises, providing a large amount of information and implementing the digital transformation may be a burden for the enterprises.

Thirdly, the algorithm black box infringes on the power of enterprises: The algorithm itself is not completely transparent due to the complexity of the technology, and the exclusivity of the user, which causes the unknown process of the algorithm for the enterprise, which can only passively accept the results of the algorithm for the enterprise and has the possibility of being infringed ^[12].

Fourthly, unknown algorithms affect the reputation of enterprises: The database of digital government is often difficult to exclude some abnormal data, thus leading to unknown algorithm which in return leads to the government department's mistake to regulate and enforce laws on certain enterprises. Further, it may generate algorithmic unknown risks, subsequently, affect the corporate reputation^[13].

4. The response of building digital government to optimize the business environment

Patrick Dunleavy, a leading proponent of digital governance theory, systematically elaborated the theory in 2006, where digitalization is a process emphasizes reintegration, demand-oriented holism, and digital operation of government at the organizational, process, and technical levels, respectively^[14]. The responses of a building digital government to optimize the business environment can be described based on three levels.

First: Laws and regulations should be used to regulate the data collection behavior of government departments for enterprises. Appropriate legislation should stipulate the scope of application of government departments' power to collect the data^[15], ensure the security of enterprise data, and the orderly flow among government departments, further try to avoid the leak of data and confidential information.

Second: Form a specialized agency to collect data and to review abnormal data, by selecting dedicated personnel to improve the data accuracy. Real-time monitoring of data while reviewing data, establishing a sound risk prevention, control early warning mechanism^[16], and mitigating the consequences which are caused by algorithmic black boxes, and unknown algorithms as much as possible.

Third: Strengthen the cooperation between government and enterprises. Government departments due to their technical and functional limitations, it is more difficult for them to achieve continuous optimization of the business environment, therefore there is a need for synergistic cooperation between government departments and enterprise in the process of business environment optimization^[17], to effectively achieve the goal of optimization at the same time can strengthen the communication and cooperation between the market players.

Fourth: The needs of enterprises as a guide to optimize the government process. Optimization of the business environment should be based on the needs of the particular enterprises, where big data analysis and other methods can be used to predict the needs of enterprises, subsequently, provide personalized services to the enterprises based on their demands^[18], and effectively improve the efficiency of business environment optimization.

Fifth: The promotion of information technology applications to enhance innovation and intelligent services. Government departments are good at using big data analysis, AI and other digital technologies to make up for the lack of empirical intuition, provide more transparent and convenient services for enterprises, and make decisions with more intelligent and scientifically^[19].

5. Conclusion

Optimizing the business environment is a key indicator for assessing the performance of digital government, therefore the construction of digital government is also a key factor in optimizing the business environment, and its impact is reflected in the open sharing of public data, the common sharing of government information, and the accurate collection of law enforcement evidence^[20]. However, everything has two sides, the construction of digital government will prove an important impact on the optimizing of the business environment, but it also can cause risks. Some countermeasures are proposed in this paper to address these risks, namely, regulating the data collection behavior of government departments for enterprises by laws and regulations and others.

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Transformation and Upgrading Development Strategy of Ceramic Industry Cluster in Guangdong-Hong Kong-Macao Greater Bay Area Based on the Concept of Green Development

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Abstract: On February 18, 2019, the Central Committee of the Communist Party of China and the State Council issued the ‘Guangdong-Hong Kong-Macao Greater Bay Area Development Plan’ where the Greater Bay Area will undergo green and low-carbon development with four major innovations, and there is the core competitiveness of Guangdong, Hong Kong, and Macao to build a world-class bay area. In the past ten years, the ceramic industry, which belongs to the manufacturing industry, has formed an industrial cluster advantage in the Greater Bay Area. However, the continuous economic downturn in the international market, coupled with anti-dumping and other trade barriers, has impeded the export of ceramic industry products, and the domestic overcapacity and environmental. Additionally, the pressure of pollution has forced the government to issue various industrial policies and environmental protection policies to guide the upgrading and the transfer of the ceramic industry. The arising internal and external problems are restricting the improvement of the green innovation performance of the ceramic industry cluster in the Greater Bay Area under high-quality development. This paper analyzes the key factors which are restricting the improvement of green innovation performance of ceramic industry clusters in the Greater Bay Area. Further, a specific improvement path and policies for the high-quality development of the ceramic industry in the Greater Bay Area were proposed in this paper.

Keywords: Ceramic industry; Green economy; Technological innovation; Green development

Online publication: July 14, 2022

1. Introduction

On February 18, 2019, the Central Committee of the Communist Party of China and the State Council issued the ‘Guangdong-Hong Kong-Macao Greater Bay Area Development Plan.’ The Greater Bay Area will undergo green and low-carbon development with four major innovations ^[1]. The high-quality development of the manufacturing industry is the core competitiveness; therefore, it is important for Guangdong, Hong Kong, and Macao to build a world-class bay area ^[2]. In the past ten years, the ceramic industry, which belongs to the manufacturing industry has formed an industrial cluster advantage in the Greater Bay Area. The ceramic production and export have a heavy weight position in worldwide, including China, where these economic mosaics are not only contributing to the growth of the regional economy, but also dominate the country’s competitive advantage ^[3]. However, trade barriers such as anti-dumping and other trade barriers contributes to the continues economic downturn in the world, have impeded the export

of ceramic industry products, domestic overcapacity and environmental pollution pressure, thereby forcing the government to issue various industrial policies and environmental protection policies to guide the upgrading and the transfer of the ceramic industry ^[4]. These unfavorable factors restrict the improvement of the green innovation performance of the ceramic industry cluster in the Greater Bay Area ^[5,6].

This paper focuses on the background of high-quality development, and consider the characteristics of green innovation in the manufacturing industry. Path selection and policy recommendations for cluster green innovation performance improvement to guide high-quality development practices was also discussed in this paper.

2. Literature review

The measures to promote the high-quality development of the manufacturing industry should not only reduce inefficient output, promote supply-side structural reform, but also should enhance technological innovation capabilities, encourage innovation and entrepreneurship ^[7], accelerate industrial integration, and promote the quality, efficiency, and power changes of manufacturing development ^[8]. The high-quality development of the manufacturing industry should have positive characteristics in term of quality, efficiency, power, coordination, greenness, openness, and sharing ^[9-11]. In the process of promoting the high-quality development of the manufacturing industry, elements such as innovation, capital, and human capital play an irreplaceable role. Among them, innovation is the first driving force for the manufacturing industry to move towards the high-quality development ^[12,13]. It is believed that the high-quality development of the manufacturing industry is a realistic choice to actively adapt to the new economic system, and solve the problems of unbalanced and insufficient development of the manufacturing industry ^[14]. The high-quality development of the manufacturing industry is focused on improving the quality of the supply system, and on the intelligent manufacturing, service-oriented manufacturing, green manufacturing, and high-quality manufacturing ^[15-17], and the initial point is promoting a high-quality development of the manufacturing industry ^[18]. At present, the innovation of China's ceramic industry is not at a high level, therefore the ceramic industry cluster has a significant effect on the improvement of innovation ability ^[19,20].

3. Constraining factors in the improvement of green innovation performance of ceramic industry clusters in Guangdong-Hong Kong-Macao Greater Bay Area under high-quality development

3.1. Regional economic development varies greatly

At the end of 2018, the Greater Bay Area created 11.71% of the national gross domestic product (GDP), however there are still some constraints on the economic development in the Bay Area. Therefore, the development level of green innovation in the ceramic industry cluster is closely related to the economic development level of a region. The economic development level of the Greater Bay Area is analyzed using the data of GDP, and per capita GDP as shown in **Figure 1**.

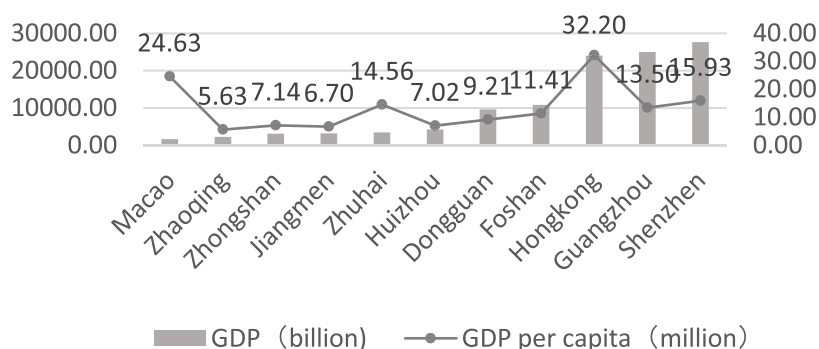


Figure 1. GDP and per capita GDP of cities in the Greater Bay Area in 2020

According to **Figure 1**, For Hong Kong, under the influence of adverse factors such as the decrease in exports and sluggish consumption under the impact of the new crown epidemic, the per capita GDP is still far ahead in the Greater Bay Area with a per capita GDP of 322,000 yuan. Although Macau's GDP is at a relatively low level compared to other cities in the Greater Bay Area, the per capita GDP level is on the second place after Hong Kong, reaching per capita GDP of 246,300 yuan. Compared to Pearl River Delta cities, Hong Kong, and Macao, the per capita GDP of Guangzhou, Shenzhen, Foshan, and Zhuhai is more than 100,000 yuan, and there is still a large gap between the per capita GDP levels between Hong Kong and Macao. In addition, Zhaoqing showed the lowest per capita GDP with only 56,300 yuan compared to other cities.

3.2. The technological innovation mechanism is not yet perfect

The technological innovation, product research and development, comprehensive utilization of production resources, and sustainable development of the ceramic industry in the Greater Bay Area are inseparable from the support of high-tech ceramic industry professionals. The World University Third-Party Index (TUI) is the fourth eye for third-party evaluation of universities, which can comprehensively measure the status of universities. The Greater Bay Area is compared with other three major bay areas in different country based on the evaluation ranking by TUI, and the number of selected universities is shown in **Figure 2**.

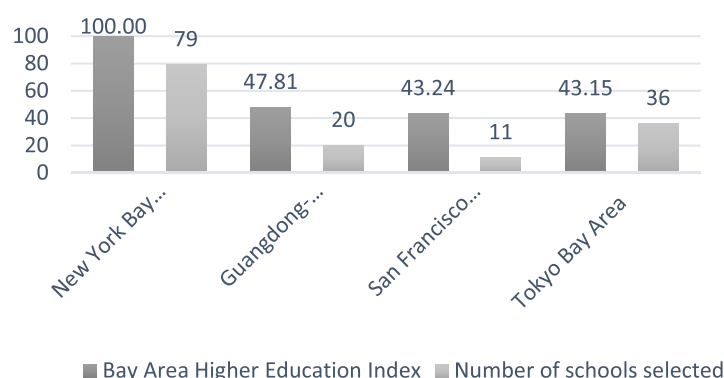


Figure 2. Evaluation rankings and the number of selected universities in the Big Four Bay Area World University Third-Party Index (TUI)

Hong Kong, Guangzhou, Foshan, and other core cities gather more ceramic innovation elements and resources, and have relatively rich experience in ceramic innovation. However, since the innovation resource cooperation mechanism has not been perfected, therefore the innovation resource cooperation relationship between cities needs to be strengthened. In addition, it is difficult for non-core cities such as Jiangmen and Zhaoqing to obtain the elements and resources which are required for ceramic innovation in timely, resulting in uneven distribution of ceramic innovation resources, thereby it is not conducive to continue the innovation and development of the ceramic industry in the non-core cities. Therefore, the Guangdong-Hong Kong-Macao Greater Bay Area still needs to improve the innovation resource cooperation mechanism, by taking the core cities as the radiating poles, activate the innovation power and potential of non-core cities, and encourage cities with a lower level of technological innovation.

4. Improvement paths and policy recommendation for green innovation of ceramic industry clusters in Guangdong-Hong Kong-Macao Greater Bay Area under high-quality development

4.1. Improve the top-level design of the economic system, and promote high-quality economic development

China, social and economic development is in a transition period from high-speed to high-quality development. However, affected by factors such as economic downturn, Sino-US trade friction, and the tightening of coal-to-gas environmental protection policies, the Greater Bay Area Ceramics Industrial development become slowed down. According to the Guangdong Ceramic Industry Data released by the Guangdong Ceramics Association from January to May 2020 the output of ceramic tiles by enterprises designated size in Guangdong Province was 615.379 million square meters, with a decrease of 20.2% yearly. Meanwhile the output of sanitary ceramics was 15.687 million pieces with a decrease of 22.1% yearly. Due to the development problems such as low entry barriers, high energy consumption, high pollution, and slow transformation, and upgrading of green innovation for ceramic enterprises in the Greater Bay Area, therefore the government should continuously improve and optimize the top-level design of the economic system to provide economic development in the Greater Bay Area with a solid guarantee.

4.2. Give full play to the synergistic effect of green innovation, and enhance the level and intensity of green innovation

Innovation and development should focus on solving the problem of development momentum, and green development, similarly solve the problem of harmony between man and nature. The government should increase the incentives for innovation funds for the ceramic industry in the Greater Bay Area, to encourage the ceramic enterprises to continuously improve their independent research and development capabilities, and master more key and advanced technologies. In addition, the government should encourage green innovation cooperation between small and medium-sized ceramic enterprises with large-scale ceramic enterprises, construct a systematic innovation cooperation platform, strengthen exchanges and cooperation between ceramic enterprises in the Greater Bay Area, and realize the sharing of technical information resources, thereby changing the concept of ‘I have no people to I have more people’, and believe in the concept of ‘I have more people, than I have competitive advantage’. A series of measures are conducive to promote the formation of the green innovation pattern of the ceramic industry in the Greater Bay Area, and to a certain extent, are conducive to the coordinated development of the economy, society and ecological environment of the Greater Bay Area.

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High-Quality Development of Ceramic Industry Clusters in Guangdong-Hong Kong-Macao Greater Bay Area Based on Green Innovation

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Abstract: In the past ten years, the ceramic industry which, belongs to the manufacturing industry, has formed an industrial cluster advantage in the Guangdong-Hong Kong-Macao Greater Bay Area in China. However, the continuous economic downturn in the international market, coupled with anti-dumping and other trade barriers, and the domestic overcapacity and environmental pollution pressure has impeded the export of ceramic industry products. The internal and external problems are restricting the improvement of green innovation performance of the ceramic industry cluster in the Guangdong-Hong Kong-Macao Greater Bay Area under the high-quality development. This project divides green innovation into several stages and levels for analysis, and establishes an evaluation index system in three dimensions: green economic benefits, technological innovation, and green development. Data on the factors affecting the high-quality development of the ceramic industry in the Guangdong-Hong Kong-Macao Greater Bay Area were extracted from databases such as CSMAR, WIND, RESSET, and CCER, followed by empirical tests. Finally, the specific improvement path for the high-quality development of the ceramic industry in the Guangdong-Hong Kong-Macao Greater Bay Area is obtained, and lastly the policy recommendations is proposed in the paper.

Keywords: Ceramic industry; Green economy; Technological innovation; Green development

Online publication: July 14, 2022

1. Introduction

The Guangdong-Hong Kong-Macao Greater Bay Area will undergo green and low-carbon development with four innovations ^[1]. High-quality development of the manufacturing sector is the core competitiveness of Guangdong-Hong Kong-Macao to build a world-class Bay area ^[2]. In the past ten years, the ceramic industry, which belongs to the manufacturing industry, has formed an industrial cluster advantage in the Guangdong-Hong Kong-Macao Greater Bay Area. Its ceramic production and export have a heavyweight position worldwide, including in China ^[3,4]. These economic mosaics are not only the growth points of the regional economy, but also dominate the country's competitive advantage ^[5]. Based on the above background, this project will build an evaluation index system which is suitable for the green innovation performance of ceramic industry clusters through small sample testing, analysis, and exploration of existing data, subsequently proposed path selection and policy for green development of ceramic industry clusters. As an important part of the national economy, the ceramic industry has a high energy consumption, pollution, and emission industry. Its green innovation performance often showed the characteristics of

multi-level and multi-influencing factors; therefore, it cannot be evaluated by a single index at a single level [6-8]. High-quality development is an essentially green development, and innovation has become the primary driving force, while green innovation has become the common form of development [9-11]. Based on the green innovation performance of the ceramic industry cluster, the path selection and policy suggestions for improving the green innovation performance of the ceramic industry cluster in the Guangdong-Hong Kong-Macao Greater Bay Area are given to guide the practice of high-quality development.

2. Research on high quality development of manufacturing industry and industrial cluster

The high quality of the manufacturing industry is a combination of breaking and standing development. In terms of measures to promote the high-quality development of the manufacturing industry, it is essential to reduce inefficiency and ineffective output, enhance technological innovation capabilities, encourage innovation and entrepreneurship, accelerate industrial integration, and also promote the quality, the efficiency, and the power changes of manufacturing development [12-14]. Manufacturing can achieve the high quality if it has the seven characteristics of quality, efficiency, power, coordination, greenness, openness, and sharing [15,16]. In the process of promoting the high-quality development of the manufacturing industry, elements such as innovation, capital, and human capital play an irreplaceable role. Among them, innovation is the first driving force for the manufacturing industry to move towards the high-quality development [17]. Industrial clusters are the core and foundation for realizing industrial chain reconstruction [18]. A sound and complete industrial chain and industrial clusters are the major advantage in China's development process, and as an important cornerstone for China to become a powerful manufacturing country [19]. Therefore, the ceramic industry clusters play a significant role in improving innovation capabilities [20].

3. Empirical test of green innovation performance of ceramic industry cluster under high quality development

3.1. Index weight analysis based on analytic hierarchy process

Analytic Hierarchy Process is a decision-making method that decomposes decision-related issues and related factors into the target, criterion, and program layer, followed by qualitative and quantitative analysis. By determining the subjective weights of the three dimensions of green economy, technological innovation, and the green development, and analyzing these weights, this project can more objectively by analyzing the influencing factors of the green innovation performance of the ceramic industry cluster.

According to the entropy method, a judgment matrix is constructed for the green economy, technological innovation, and green development, followed by calculation of the weight vector of the judgment matrix. Finally, the consistency test is conducted on the judgment matrix, $CR < 0.1$, and the consistency test is passed to ensure the rationality of the data. The weight of each index is shown in **Table 1**.

Table 1. Index weight

First-level indicator	Weights	Secondary indicators	Weights
Green economy	0.7380	GDP	0.4920
		GDP per capita	0.2460
Technological innovation	0.1676	R&D activities staff	0.0838
		R&D expenses	0.0838
ECO development	0.0944	Urban sewage treatment rate	0.0472
		Harmless treatment rate of municipal solid waste	0.0472

According to **Table 1**, under the first-level indicators, green economy has the largest weight, followed by technological innovation, and green development, and the weight of the green economy is far greater than the other two indicators, indicating that the green economy is the most important factor affecting the Guangdong-Hong Kong-Macao Greater Bay Area. Meanwhile, the important factor in the green innovation performance of the ceramic industry cluster in the district. From the two indicators of Gross domestic product (GDP) and per capita GDP, it is demonstrated that the economy has a greater impact on the ceramic industry.

3.2. Index weight analysis based on entropy method

The law of entropy value is a method to determine the weight by combining the information value provided by the entropy value. The weights are analyzed, and the factors affecting the green innovation and development of the ceramic industry cluster in the Guangdong-Hong Kong-Macao Greater Bay Area are obtained.

Table 2. The weight table of each index under the entropy method

First-level indicator	Weights	Secondary indicators	Weights
Green economy	0.2834	GDP	0.1650
		GDP per capita	0.1184
Technological innovation	0.5744	R&D activities staff	0.2879
		R&D expenses	0.2865
ECO development	0.1422	Urban sewage treatment rate	0.1001
		Harmless treatment rate of municipal solid waste	0.0421

According to **Table 2**, under the first-level indicators, technological innovation has the largest weight, followed by green economy, and green development, and the weight of technological innovation is significantly different from the other two indicators, indicating that technological innovation has a significant impact on the Guangdong, Hong Kong and Macao. Meanwhile, the impact of green innovation in the ceramic industry cluster in the Greater Bay Area is more obvious. The Guangdong-Hong Kong-Macao Greater Bay Area has formed the advantages of industrial clusters, however, there are still problems such as overcapacity and environmental pollution pressure, and the above-mentioned indicators, weight ratios, which clearly show that technological innovation has a greater impact on the ceramic industry in the Guangdong-Hong Kong-Macao Greater Bay Area.

3.3. Comprehensive weight analysis based on AHP and entropy method

Based on analytic hierarchy process and entropy method, the influencing factors of the green innovation and development of the ceramic industry cluster in the Guangdong-Hong Kong-Macao Greater Bay Area was analyzed, and subsequently the comprehensive scores were obtained and ranked.

Table 3. Comprehensive score sheet

Index	Overall ratings	Rank
Green economy	0.5107	1
Technological innovation	0.3710	2
ECO development	0.1183	3

Table 3 showed that the green economy has the most obvious impact on the green innovation and development of the ceramic industry cluster in the Guangdong-Hong Kong-Macao Greater Bay Area, followed by technological innovation, and green development, however, the impact of green development is lower. This suggests that the high-quality development of the ceramic industry in Guangdong, Hong Kong and Macao requires attention to the development of green economic indicators. The ceramic industry is an industry with high energy consumption, pollution and emissions. Therefore, the traditional model is no longer suitable for the development of modern society, thereby a rapid economic development should be conducted on the basis of green innovation.

4. Improvement paths and policy suggestions for green innovation of ceramic industry clusters in Guangdong-Hong Kong-Macao Greater Bay Area under high-quality development

With the development of the ceramic industry cluster, the shortcomings of the ceramic industry's technological innovation mechanism have not been perfected, and the lack of awareness of green environmental protection has gradually been exposed, and the institutional innovation should provide a scientific basis.

4.1. Improve the top-level design of the economic system, and promote high-quality economic development

China's social and economic development is in a transition period from high-speed to high-quality development. Affected by factors such as economic downturn, novel coronavirus pneumonia, Sino-US trade friction, and the tightening of coal-to-gas, environmental protection policies, the development of the ceramic industry has become slow. Based on the development difficulties, such as low entry threshold, high energy consumption, high pollution, and slow green innovation transformation and upgrading of ceramic enterprises, the government should continuously improve and optimize the top-level design of the economic system to provide a solid guarantee for the economic development of the Greater Bay Area.

4.2. Improve the contribution rate of economic growth, and increase the output of technological innovation

Investment in the scientific and technological research and development of ceramics should be increased, continuously improve the independent research and development capabilities of ceramic enterprises, focus on the research and development of key technologies of ceramic enterprises, use advanced ceramic technology to develop more high-end ceramic products, and increase the added value of ceramic products. Additionally, utilize the excellent educational resources in the region and rely on the technical resources of local universities to promote the establishment of long-term and stable relations between ceramic enterprises and scientific research units of local universities, thereby promote the integration of production and education, school-enterprise cooperation, and give attention to the university's own scientific research advantages and enterprise resources. Further, together introduce high-level talents.

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Current Status of China's Business Environment Research Based on CiteSpace Bibliometric Analysis

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Abstract: A good business environment is not only a necessary condition for the healthy development of enterprises, but also an important reflection of the core competitiveness of a country and region. A comprehensive overview of the current status of business environment research is conducive to understanding business environment research. Based on CiteSpace's metrological and graphical analysis of 1,168 core journals in the CNKI database from 2000 to 2022, it is found that the hotspots of business environment research in China are mainly focused on the reform of "management and service," "high-quality economic development," "government services," and "the path of optimizing business environment." The clustering results and high-frequency word clouds show that the keywords of business environment have evolved into several sub-themes, including several research clusters, such as decentralization, soft business environment, and private economic development. With the development of high-quality economy, the conversion and integration of research paths in business environment, as well as the expansion and updating of research perspectives, the research on optimizing business environment will become a new academic growth point in research.

Keywords: Business environment; Mapping analysis; Visual econometric analysis; CiteSpace

Online publication: July 14, 2022

1. Introduction

In the recent years, China has continuously strengthened its management and service reform, as well as optimized its business environment. The optimization of its business environment by accelerating the transformation of government function to create a relaxed market environment is China's top priority. Optimizing the business environment stimulates market vitality and enhances the endogenous power of high-quality economic development, as well as further accelerates the construction of a modernized economic system ^[1-3]. Its domestic business environment continues to improve, and its world ranking continues to rise, reflecting the potential and resilience of China's economic development. The market is constantly changing; therefore, the business environment should also be optimized accordingly. Although there is a significant improvement in the business environment, it is still not ideal. At present, China's economy is steadily recovering, achieving a stable development state and improving; however, it should be clear that the overall development environment of the world economy is facing many risks and uncertainties, such as the incident of the global new crown pneumonia pandemic, thereby the domestic consumption

power is still weak ^[4-6]. Under such circumstances, optimizing the business environment is an extremely important initiative to further boost the vitality of market players, unlock consumers' consumption potential, and subsequently enhance the momentum of economic growth. In order to explore the evolution of business environment research in China and deepen the research basis, research hotspots and frontiers in this field should be conducted. This paper will use the mapping visualization software CiteSpace to conduct econometric and mapping analysis on previously published literatures related to business environment from 2000 to 2022, in order to demonstrate the ins and outs of business environment research in China from a panoramic view, with an aim to provide references for further research on business environment.

2. Data sources and research methods

This paper uses the China Academic Journals (CNKI) (Online Edition) database (2000-2022) as a data source and integrates econometric analysis and information visualization through the use of CiteSpace to identify the temporal and network distribution characteristics of business environment research by exploring the research hotspots and development directions of business environment, so as to provide theoretical support and reference for scholars to analyze the current situation of business environment research, and subsequently develop the latest research frontier. In order to ensure the quality of the literature and the authority of the data, the literatures are collected from Chinese core journals (Peking University Core), Chinese Social Sciences Citation Index (CSSCI), and Chinese Science Citation Database (CSCD). A total of 1,218 documents were retrieved from the database; however, after elimination of duplication and invalid documents, such as briefings, conference announcements, book reviews, recommendations, advertisements, and some other unrelated documents to the research topic, only 1,168 documents remained for subsequent analyses.

3. Business environment optimization research spatio-temporal knowledge mapping and its analysis

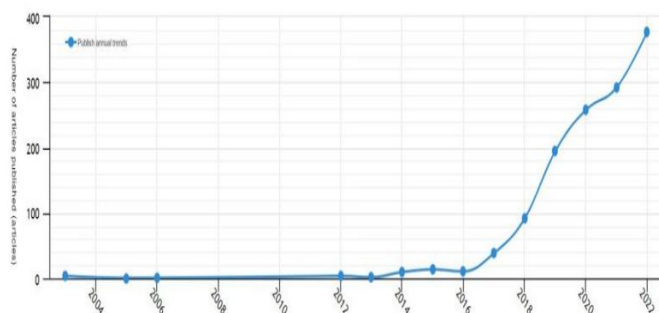


Figure 1. Distribution of the number of research literature

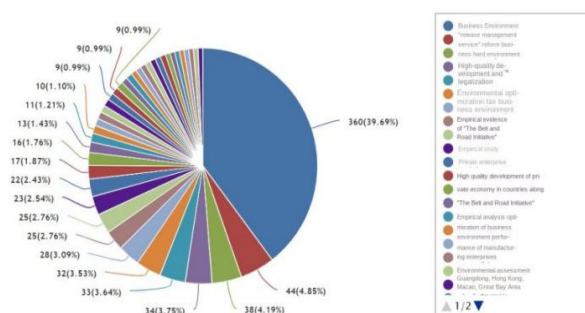


Figure 2. Distribution of research themes related to business environment

3.1. Bibliometric analysis

To understand the research on business environment over the years, the distribution of 1,168 literatures is shown in **Figure 1**. In general, the number of publications on business environment research from 2000-2022 is in an upward trend. Meanwhile, the number of publications and the trend of business environment literature every year from 2000 to 2022 is also shown in **Figure 1**. In the year 2000 to 2016, the number of publications remained rather low. However, from 2016 onwards, a rapid rise in the number of literatures on business environment research was observed, with the largest number of publications in 2022, with 400 publications, indicating that academics are taking an interest in the field of business environment. This also shows that the literature research heat is closely related to relevant policies and the actual situation of

business environment. Therefore, scholars should closely focus on the policy background and social reality of business environment development in China for their research.

3.2. Literature topic distribution

According to **Figure 2**, it can be seen that the research themes related to business environment are commonly concentrated in the areas of decentralization, high-quality economic development and enterprise performance assessment. Therefore, optimizing the business environment in China is very urgent, because it is not only the realistic need for an international competition, but also the voice of China's enterprise development. In the future, by reducing systemic transaction costs, deepening the government's own reform, and working on measures, such as administrative and service reform, it is possible to guide the market expectations and reassure entrepreneurs. Only in this way the innovative energy of enterprises can continue to burst forth, thereby supporting the economics' high-quality development [7-11].

4. Analysis on the content of business environment research and its evolution

4.1. Business environment keyword co-occurrence mapping analysis

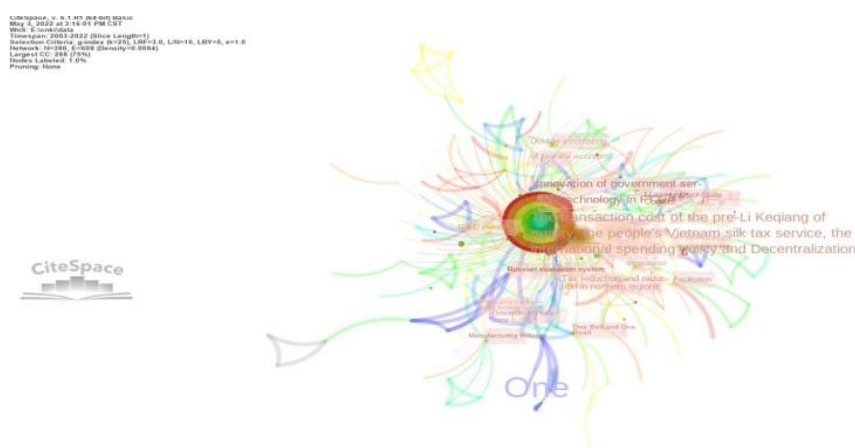


Figure 3. Business environment keyword co-occurrence network mapping

CiteSpace provides a node type; for example, the keywords are used for statistical analysis by determining the frequency of the keyword used, so as to grasp the hotspots and trends in the related fields. Co-occurrence analysis is performed using keywords to obtain a keyword co-occurrence knowledge map on the study of business environment optimization as shown in **Figure 3**. Among them, the time span of the study is set to “Years”, the “Minimum Spanning Tree” algorithm is used, and other default format of the system is adopted, as shown in **Figure 3**. The size of the node represents the size of the frequency of the keyword occurrence, in which the larger the node, the higher the usage of the keyword, and the easier for it to become a research hotspot. **Figure 3** shows that the largest node is business environment, which appears the most frequent in these documents. On the one hand, it is because the main subject of this paper is regarding business environment, therefore the other keywords will also focus on business environment as well; on the other hand, it is because most scholars consistently and habitually list business environment as a keyword in their research or articles. Other keywords with larger nodes, including technological innovation, credit regulation, tax and fee reduction, government services, simplification and decentralization, and business environment, indicate that these are the hotspots that scholars and experts have been paying more attention to and studying over the past years [12-15]. With the development of the economy, different research hotspots will be presented at different times and in different contexts. In addition, to better understand the concerns of scholars in the field of business environment in each time period, it is best to divide literatures of different

years into different time periods.

4.2. Analysis of the evolution of hot topics on business environment

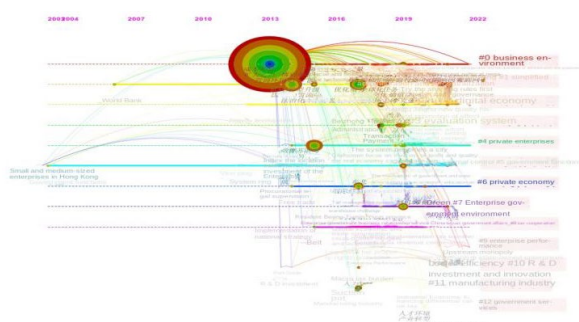


Figure 4. Timeline view of business environment research keywords

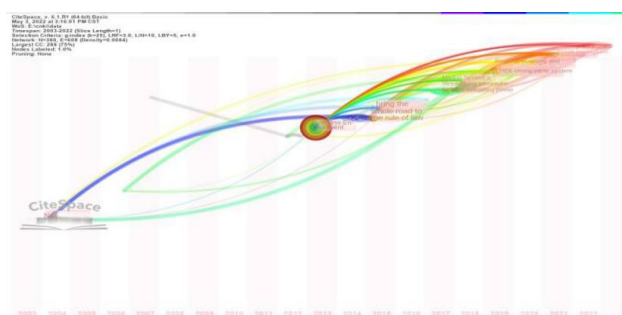


Figure 5. Time zone distribution of business environment research keywords

A time zone mapping was generated by keyword co-occurrence analysis of business environment research as shown in **Figure 4**; the nodes were gathered in the same time zone, and the time was arranged in the order from far to near; network modularity was obtained by cluster analysis shown in **Figure 5**.

The graph shows the new business environment research themes that emerged each year, from 2000 to 2022 in the time dimension. In the time zone diagram, the size of the font indicates the degree of the centrality of the word, where the larger the font, the more important the keyword in the network. **Figure 5** shows that the hot keywords since 2013 are “administrative and service reform,” “rule of law,” “decentralization,” “high-quality development,” “credit supervision,” and others ^[16]. Based on the hot keywords added after 2013 in the keyword frequency analysis, the role of business environment, decentralisation reform, and structural reform in promoting high-quality economic development, the role and effectiveness of structural reform in optimising the business environment, and the business environment of countries are the frontier areas of business environment research.

5. Research conclusion

5.1. Research findings

In this study, research literatures related to business environment in China were searched on CNKI, and information mining and collation were conducted by using CiteSpace metric visualization software to demonstrate the change in literature volume, distribution of carrier journals, and core authors over 22 years from 2000 to 2022. In addition, the frequency of important keywords was analyzed, and keyword clustering was performed. Subsequently, the following conclusions were obtained; (1) Compared with previous studies, in terms of the volume of articles issued, the research on business environment by domestic scholars increased rapidly after 2016 and maintained a high development trend; (2) In recent years, the frontier areas of business environment research mainly focused on the role of business environment in promoting high-quality economic development, the role and effectiveness of management and service reform and structural reform in optimizing business environment, as well as the business environment of the countries; (3) In terms of research content, systematic research is still lacking, therefore systematic analyses and explorations of research content are still required; (4) In terms of research themes, most of the existing studies are simply follow-ups after the introduction of national policies, which are sufficient to explain, but not to create and play guiding roles, therefore there is still a need to further improve forward-looking research themes; and (5) In terms of research extension, the existing research extension is still insufficient,

therefore there is still a need to promote interdisciplinary crossover and deepen the research in the field of business environment through multi-vision extension and multi-disciplinary crossover.

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Motivations and Initiatives of Private Enterprises' Participation in Precise Poverty Alleviation in the Implementation of Rural Revitalization Strategy

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Abstract: Under the current pattern of poverty alleviation and development, enterprises are regarded as an important subject for precise poverty alleviation and development, further the state has successively issued a series of documents to encourage and strengthen the enterprises' participation in poverty alleviation and development. By selecting relevant financial data of private listed companies in Shanghai and Shenzhen A-shares in China from 2016 to 2019, the study finds that corporate violations and participation in the precise poverty alleviation are significant and positively related. Further, this paper explores on the motives of private listed companies in precise poverty alleviation behaviors, and discuss the intrinsic link between irregularities and their behaviors, to enhance and deepen the understanding about precise poverty alleviation behaviors of the private listed companies.

Keywords: Corporate violations; Private enterprises; Precise poverty alleviation; Social responsibility

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1. Study hypothesis

Chen et al., ^[1] found that companies with poor social responsibility performance in areas, such as product safety and environmental protection were more likely to make charitable donations to maintain their corporate image and also to shift their responsibilities. In addition, Chen Ziqiu ^[2] suggest that non-state-owned enterprises' violation activities have a much greater positive impact on the precision poverty alleviation activities, compared to other state-owned enterprises ^[3].

Based on the above theoretical analysis and review of the relevant literature, the hypothesis of this study is; Corporate irregularities and corporate participation in precision poverty alleviation are significantly and positively correlated.

2. Study design

2.1. Sample selection and data sources

In this study, a group of private listed companies that was initially listed on the Shenzhen and Shanghai A-shares from 2016 to 2019 were selected as the study subject ^[4-6]. The data for the study subject was obtained from the CSMAR database ^[7-9]. After data processing, around 3846 private listed companies were chosen for the subsequent analysis.

2.2. Selection of variables and related explanations

The test variable is listed in **Table 1**.

Table 1. Variable definition table

Variable type	Variable name	Variable symbols	Variable definitions
Explained variables	Precision Poverty Alleviation	PA	Assign a value of 1 if you are involved, 0 otherwise.
	Precise amount for poverty alleviation	LPA	Natural logarithm of the amount invested by enterprises in poverty alleviation.
Explanatory variables	Non-compliance	VIO	A value of 1 is assigned if a listed company is found to have committed a breach as currently defined in the previous year, otherwise it is 0.
Control variables	Business size	Size	Natural logarithm of total assets.
	Cash holdings	Cash	Net cash flow from operating activities/total assets
	Return on Total Assets	ROA	Net profit/total assets
	Concentration of shareholding	Top1	Percentage of shareholding of the largest shareholder.
	Gearing Ratio	Lev	Total liabilities/total assets
	Company age	lnAge	Natural logarithm of the number of years the company has been existed.
	Board size	lnBoard	Natural logarithm of the total number of board members.
	Growth capacity	Growth	Growth rate of operating revenue.
	Two jobs in one	Plu	A value of 1 is assigned if the Chairman and the Managing Director are the same person, otherwise it is 0.
	Year	Year	Controls for annual fixed effects.
	Industries	Ind	Controls for industry fixed effects.

2.3. Multiple regression model construction

Based on the study conducted by Gao Lifang ^[2], two basic research models were developed in conjunction with the aim of this paper.

$$PA = \beta_0 + \beta_1 VIO + \sum Controls \text{ (model 1)} \quad LPA = \beta_0 + \beta_1 VIO + \sum Controls \text{ (model 2)}$$

To test the study hypothesis, the correlation between the occurrence of irregularities and the participation of private listed companies in precise poverty alleviation work was analyzed by establishing multiple linear regression models, 1-1 and 1-2.

$$PA = \beta_0 + \beta_1 VIO + \sum Controls \text{ (model 1-1)} \quad LPA = \beta_0 + \beta_1 VIO + \sum Controls \text{ (model 1-2)}$$

3. Research findings

3.1. Descriptive statistics

From the descriptive statistics table of variables in **Table 2**, it can be seen that nearly half of the private enterprises in China showed violations during the observation period, meanwhile about one-third of the private enterprises participated in precise poverty alleviation actions during the observation period.

Table 2. Descriptive statistics for variables

Variables	Observations	Average	Standard deviation	Minimum value	Maximum value
Non-compliance	3827	0.423	0.494	0	1
Precise poverty alleviation	3827	0.333	0.471	0	1
Precise amount for poverty alleviation	3827	4.573	6.598	0	19.04
Business size	3827	22.174	1.152	19.76	25.93
Cash holdings	3827	0.043	0.076	-0.274	0.303
Return on total assets	3827	0.024	0.107	-0.797	0.24
Concentration of shareholding	3827	0.302	0.127	0.08	0.69
Gearing ratio	3827	0.418	0.199	0.06	0.97
Company age	3827	2.934	0.266	2.2	3.56
Board size	3827	2.085	0.192	1.61	2.48
Growth capacity	3827	0.25	0.793	-0.729	11.906
Two jobs in one	3827	0.412	0.492	0	1

3.2. Regression analysis of the corporate non-compliance and corporate precision poverty alleviation

Based on the column (1-1) of **Table 3**, the regression of precision poverty alleviation (PA) on the overall level of corporate non-compliance (VIO) of private listed companies is significantly positive at the level 1%, and the regression of column (1-2) on the amount of investment in precision poverty alleviation (LPA) of privately listed companies on the overall level of corporate non-compliance (VIO) is also significantly positive at the level 1%, therefore the study hypothesis is verified, where the corporate non-compliance and participation in precision poverty alleviation are significant positively correlated. This suggests that when a company commits a violation and is investigated and punished, it is more likely the company to participate in the poverty alleviation behavior to divert the negative impact of the violation out of self-interest.

Table 3. Regression results of corporate irregularities and precision poverty alleviation in private listed companies

	VIO	Size	Cash	ROA	Top1	Lev	lnAge	lnBoard
(1-1)	0.916***	0.305***	2.524***	4.477***	0.596**	-0.658**	-0.208	0.004
PA	(11.94)	(7.51)	(4.20)	(6.82)	(1.94)	(-2.53)	(-1.37)	(0.02)
(1-2)	2.424***	1.131***	7.557***	7.267***	2.282***	-1.782***	-0.468	0.112
LPA	(12.03)	(11.01)	(5.31)	(6.75)	(2.83)	(-2.83)	(-1.19)	(0.21)
	Growth	Plu	Constant	Industry	Year	N	R*2	
(1-1)	-0.104	0.009	-8.537***	Control	Control	3827	0.133	
PA	(-1.62)	(0.11)	(-8.37)					
(1-2)	-.157	-0.075	0.167***	Control	Control	3827	0.167	
LPA	(-1.24)	(-1.24)	(-8.79)					

3.3. Robustness tests

Next is the endogeneity test ^[10-12]. This paper uses the propensity score matching method (PSM) ^[13-15] to reduce the sample self-selection bias and mitigate endogeneity problems. Firms that have committed violations and have been investigated are used as the treatment group, subsequently the PSM method is used to identify a control group for the treatment group. Meanwhile, twelve indicators were selected as covariates, as shown in **Table 4**. Logit model ^[16-18] was used to estimate the propensity scores, and the weights were determined using a 1:1 no-relaxation nearest-neighbour matching method, and common support conditions were imposed, and the pairings were proven to be valid after a balance test ^[19,20]. A dummy variable Treat was prepared for the study subjects' data after successful matching, where the private listed companies with violations were classified as the treatment group and recorded as 1, meanwhile the private listed companies with no violations were classified as the control group and recorded as 0. The matching was then regressed and the regression results are shown in **Table 4**. The correlations and significance are consistent with the results of the aforementioned multiple regressions, which again verified the study hypothesis, further indicating that the multiple regression results are robust.

Table 4. Regression results based on propensity score matching method

	VIO	Size	Cash	ROA	Top1	Lev	lnAge	lnBoard
(1-1)	0.989***	0.362***	2.706***	4.28***	0.383	-0.429	-0.209	0.157
PA	(9.30)	(6.41)	(3.27)	(4.60)	(0.89)	(-1.18)	(-0.98)	(0.54)
(1-2)	2.6***	1.261***	7.618***	6.455***	1.773	-0.98	-0.589	0.438
LPA	(9.59)	(8.96)	(3.98)	(4.15)	(1.59)	(-1.11)	(-1.08)	(0.59)
	Growth	Plu	Constant	Industry	Year	N	R*2	
(1-1)	-0.162	0.094	-9.939***	Control	Control	3827	0.146	
PA	(-1.54)	(0.86)	(-6.95)					
(1-2)	-0.168	0.129	-25.768***	Control	Control	3827	0.188	
LPA	(-0.96)	(0.46)	(-7.16)					

4. Conclusion

This paper selects financial data related to private listed companies in Shanghai and Shenzhen A-shares from 2016 to 2019 in China to empirically explore whether companies have a strong incentive to participate in the precise poverty alleviation work after they have committed irregularities followed by investigation and punishment. The theoretical and empirical analysis showed that the corporate non-compliance and corporate participation in poverty alleviation are significantly and positively correlated. That is, after a violation has occurred, as the negative impact of the violation will cause losses to the enterprise, the enterprise will try to divert the negative impact through a number of ways, including participation in the precision poverty alleviation work. This is because, the corporate social responsibility could help to build a good social image for the enterprise, thereby divert the public's attention from the bad incident, subsequently diminish the negative impact of the violation on the enterprise.

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Disclosure statement

The authors declare no conflict of interest.

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Exploring the Effective Path of Combining Rural Revitalization and Ecological Civilization Construction: Fuzhou City, Fujian Province as an Example

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Abstract: The opinions of the State Council of the Central Committee of the Communist Party of China on the implementation of the strategy for the revitalization of the countryside clearly proposed that by 2050 the countryside will be fully revitalized with strong agriculture, beautiful countryside, and rich in farmers. In recent years, with the promotion of the rural revitalization strategy, the majority of rural areas have ushered in many developments and opportunities, however, they have also suffered serious ecological damage. By taking Fuzhou City, Fujian Province, as an example, this paper discusses the dilemma and solution paths of rural ecological civilization construction in Fuzhou City in the context of rural revitalization, with the intention of realizing the organic integration of rural revitalization and ecological civilization construction, further providing experience and inspiration for the villages in other regions of China.

Keywords: Rural revitalization; Ecological civilization construction; Fuzhou

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1. Introduction

Countryside is a regional assemblage of ecological and social features with extraordinary effectiveness for human production and survival, and it complements the city by forming a space which human beings can dependent ^[1]. There is a proverb in China, which is “When the countryside thrives, the nation thrives, and when the countryside declines, the nation declines.” The contradiction between the growing needs of the people for a better life, and unbalanced and inadequate development in the countryside, where China is still in the primary stage of socialism with large manifestation of its characteristics. The most arduous and onerous task of building a moderately prosperous society and a strong socialist modern state lies in the countryside, because the most extensive, profound foundation, greatest potential, and strength lies in the countryside ^[2]. In addition, it must be noted that due to various factors such as human, technical, and ecological awareness, there are still a certain number of villages in the country that are in relatively serious ecological difficulties, therefore, there is an urgent need to implement an effective solution to address them. On August 2016, Fujian was listed as one of the first national pilot ecological civilization zones ^[3]. How to reach the deployment requirements of the central and provincial committees, persistently accelerate the integration of development and ecological protection, steadily promote the preparation of a pilot ecological civilization zone in Fuzhou, and accelerate the green development of a blessed state and a happy city, is a

major issue at present.

2. Rural revitalization should be effectively integrated with ecological civilization

Urbanization and the industrialization of rural poverty eradication have certainly led to the involvement of many modern industries in the countryside, which bring development and opportunities to the local area, however, it also brings a huge impact on the ecological environment of the countryside. At present, in China's rural areas, there is insufficient supervision of industrial development and industrialized production, additionally many enterprises have caused serious destruction to the ecological environment of the countryside. For example, their sloppy management methods, backward technical levels and facilities, irregular management, and the large amount of untreated waste water, and exhaust gas produced during production has created an indelible mark on the rural environment, which deviates from the original goals of rural revitalization, which are building beautiful villages, improving the value of ecological civilization, and achieving rural farmers' prosperity. Therefore, it is very important to increase the protection of the rural environment, speed up the prevention and control of pollution sources, improve the rural living condition, and attach importance to ecological governance, which is not only related to the orderly promotion of the rural revitalization strategy, but also to the prosperity and stability of the country and society, and more importantly, to the enhancement of the farmers' happiness, satisfaction, and sense of acquisition. To allow the residents to have the opportunity to see the mountains, the water, and remember their nostalgia is the right thing to do when building a beautiful countryside that is ecologically pleasant to live in ^[4]. In addition, there is proverb in China, which is "If ecology flourishes, civilization will flourish, and if ecology fails, civilization will fail ^[5]." A new countryside with beautiful mountains and clear water with a livable ecology is not only vital to the construction of ecological civilization in Fuzhou City and the whole country, but also to the pursuit a better life for the people is also an important embodiment of rural revitalization.

3. Main problems of rural ecological construction in Fuzhou City under the goal of rural revitalization

3.1. Environmental hazards of rural farming

As the living standards increase, so does the demand for quality and quantity of the product. As a result, in the pursuit of high yields and fresh production, the farmers increase the use of pesticides and chemical fertilizers. At present, vegetables, edible mushrooms, fruits, and rice constitute as the main items of Fuzhou's rural farming products, and the obvious problems with these farming products are, they contained excessive levels of drugs, hormones, and heavy metal residues. In addition, a large amount of pollution from production and agro-industry also poses harmful to food safety. Firstly, pollution of a nature medicine refers to the pollution caused by the indiscriminate application of pesticides, where pesticides dispersed into the environment, contaminating the air, arable land, and water, therefore directly endangering human health. In addition, the consumption of agricultural products containing pesticides, and heavy metal residues may cause health threats. Secondly, fertilizer as the source of pollution, refers to the abuse of indiscriminate application of chemical fertilizers, for example, no or little organic fertilizer, unbalanced application of nitrogen, phosphorus and potassium fertilizer, application of low-priced phosphate fertilizer, and sub-grade calcium superphosphate leads to pollution. As a result, in the long run with the washing of rainwater, a large amount of fertilizer seeps into the ditches, triggering eutrophication of water bodies. Further, the sub-standard calcium superphosphate fertilizers, and small amounts of compound fertilizers can also cause heavy metal pollution of arable land ^[6].

3.2. Environmental hazards of rural livestock farming

In recent years, due to the intensive, large-scale, and modernized livestock and poultry farming methods, a large number of farms have gradually converged in some villages and rivers in Fuzhou, resulting in a high concentration of pollution pattern, and causing a severe environment problem ^[7]. Some figures show that one cow produce and discharge more sewage compared to 22 people, meanwhile one pig produce and discharge more sewage than 7 people ^[8]. According to the survey, there are few hazards of livestock farming on the environment of Fuzhou's countryside. Firstly, is the rural water quality pollution. The dirty water and sewage produced by animal husbandry are discharged arbitrarily, however, the sewage treatment is not up to standard, therefore causing serious pollution of water quality in the townships, which in turn affects the drinking water safety of the cities. There are toxic and harmful ingredients in livestock sewage, therefore if it seeps into the groundwater, it can make the groundwater carry toxic ingredients as well, which in the long run will lead to black and smelly water bodies, causing lasting water pollution, and loss of water body use efficiency. In addition, farming cause an effluent irrigates of agricultural land, causing crops to suffer from poisoning and root rot, which ultimately reduced the crop yields. Secondly, livestock farming produces large amounts of malodorous gases which contain methane, ammonia, and other toxic components, which pollute the surrounding air, and have a direct impact on the lives and health of the surrounding residents, and thirdly, livestock manure carries a large number of bacteria and parasitic eggs, which easily breeds flies and mosquitoes, which may subsequently cause the development of infectious diseases in humans and animals, thereby posing a threat to human and animal health ^[9,10].

3.3. Increasing environmental injustice in urban and rural areas

The urban-rural dichotomy has a serious impact on rural environment-related issues. In recent years, the issue of environmental management has attracted increasing attention, as reflected by the improvement of laws and policies related to environmental management, and the increased investment in solving the environment-related problems, however all of these improvements focused on the cities. As a result, the urban environment has been improved, in contrast the rural environment has been deteriorating, with a significant impact on the livelihoods, physical, and mental health of farmers. For example, the village of Houwanggezhuang in Beijing's Shunyi district has a total population of 1,000 people only, however, between the year 2003 to 2007, 25 people from this region suffered from cancer, and the root cause of this is most likely due to the Beijing Xitao Technology Development Co. The company builds its factory in 2002, since then a strong acidic smell has been released from the factory, which seriously affects the air conditions in this region. The factory also discharges a sour-smelling water into the village ditch through a 30 cm diameter pipe. This has deprived the farmers right on environmental survival ^[11], and this phenomenon of environmental injustice can be summarized as the irrational distribution of environmental resources. This shows that, while rural areas provide services to cities through natural resources, such as vegetables, food, and other means of living production, at the same time they also have to bear the pollutants transferred from cities, such as industry, animal husbandry, and domestic waste, becoming the rubbish dump of cities. In addition, the rural residents are the passive bearers of pollution, and their production and livelihood are greatly affected without receiving reasonable ecological compensation ^[12].

Next, there is inequality between urban and rural environmental management policies. Environmental governance policies are more city-centric with more investment in governance is distributed to the big cities. The General Office of Fujian Provincial People's Government's Circular on the Issuance of the 14th Five-Year Plan for Ecological and Environmental Protection in Fujian Province, mentioned that there are still shortcomings in environmental protection infrastructure and regulatory capacity. In terms of wastewater treatment, a coherent urban and rural treatment system has to be formed, and the treatment capacity of rural areas is significantly weaker than that of urban areas ^[13]. Since the reform and globalization of China, the

government has placed particular importance on environmental protection, and has enacted and implemented a series of laws and regulations on environmental protection. However, for a long period of time, the environmental laws and regulations have been inadequate, specifically inadequate legal provisions for rural environmental protection, which placed rural farmers at a disadvantage in terms of the procedures of environmental protection laws and regulations, and policies, while the lack of procedural justice may lead to legal injustice for rural farmers.

4. Exploring the path of ecological construction in the countryside of Fuzhou under the goal of rural revitalization

4.1. Paths to cope with pollution in Fuzhou's rural plantation industry

The planting industry is an important part of China's economy, and pesticides were commonly used for the crops, to prevent, control pests, and diseases in the process of planting. China's planting industry covers a large area, thereby the application of pesticides is extensive, therefore the source of pollution in the planting industry is mainly due to the use of pesticides. The use of pesticides can give an advantage and disadvantage, where pesticides are more effective to protect the crops from pests or disease, however, in a long-term use of large quantities of pesticides can cause certain adverse effects, where if the pesticides are not used properly or correctly, it can easily cause poisoning in humans and animals, or endanger the growth of crops. Therefore, pesticides should be scientifically and rationally applied to plants, additionally penalties should be increased for the arbitrary sale or application of highly toxic pesticides, to eliminate the pesticides from the source, and to prevent the pesticides from causing irreversible damage to the ecological environment, ultimately endangering human health. In addition, Fuzhou should effectively implement pesticide reduction initiatives, strengthen pesticide research and investment, and devote themselves to research and development of less harmful pesticides to reduce the environmental pollution caused by pesticides.

Next, ensure the rural drinking water safety and quality of the rural water sources. To grasp the water quality dynamics of water sources, to discover the reported problems in a timely manner, and to timely preventing and control, a water quality monitoring and control should be strengthened. Early detection, prevention and control will ensure the safety of drinking water for rural and urban residents.

Lastly, guide farmers to change their agricultural development model towards ecological agriculture [14,15], where vigorously promotes green and organic agriculture by reducing the amount of pesticides used, reducing the pollution of rural arable land, increasing the water quality, air, and other environments, and also promoting and demonstrating advanced ecological farming techniques, thus can achieve a sustainable development while safeguarding farmers' farming returns. At the same time, insist on promoting the safe use of contaminated arable land, increase investment in scientific research on safe arable land use technology, and introduce scientific and technical talents to enhance the repeated safe use of contaminated arable land.

4.2. Pathways for coping with livestock pollution in rural Fuzhou

Firstly, use the livestock feed, scientifically. The livestock and poultry cannot survive and produce without feed. The misuse of feed causes a large number of harmful substances to be concentrated in the body of stored birds, which directly affects their health, and produces harmful odors. To ensure the quality and proportion of the bird feed, the choice of Chinese herbs, probiotics, and other pollution-free organic feed can be used, which can regulate the intestinal flora of stored birds, improve the digestive and absorption capacity of stored birds, and also can reduce the rate of abnormal defecation of stored birds. Additionally, the rate of absorption of nutrients of stored birds can also be improved, thereby maintaining the health of the stored birds [16]. To a certain extent, it can control the number of toxic odor emissions of stored birds, subsequently reduce air pollution.

Secondly, improve the manure pollution treatment system to achieve the transformation from manure to energy. Increased the investment in manure recovery and transformation technology for the stored poultry, or purchase ecological services from professional livestock and poultry pollution treatment enterprises, additionally, promoting the construction of biogas projects to improve the availability of methane and digestate, to achieve the transformation of manure-biogas-energy^[17].

Thirdly, enhance the environmental awareness of farming enterprises. Farmers hold the actual operation of the livestock and poultry farming industry, their knowledge on environmental awareness directly affects the effectiveness of livestock pollution control. Therefore, it is vital to educate farmers and farming enterprises on environmental protection, and introduce the concept of ecological civilization development. This requires the government and relevant organizations to place their efforts in promoting the concept of environmental protection, and ensuring the implementation of multi-faceted, multi-disciplinary, and multi-channel publicity and education efforts. During the farming activities, the supervisory authorities should be strictly supervised the farmers and farming enterprises, to effectively control their behavior, and if it is necessary, impose certain penalties on them, thereby the farmers and farming enterprises will consciously form the concept of environmental protection, and reduce the phenomenon of arbitrary emissions and pollution^[18].

4.3. Value urban and rural environmental equity and justice, and build the concept of urban and rural environmental community

Urban and rural areas are inherently interdependent, and they cannot be separated, therefore, the environmental problems in rural areas should be solved together. The concept of an urban-rural environmental community should be constructed, in contrast the path of urban-rural duality should not be followed^[19]. Meaning that it is important not only focusing on improving the urban environment, but also not ignoring the countryside altogether. Rather, a coherent urban-rural governance system should be developed, and rural governance models should be improved. In the case of cities, policies, and laws need to be implemented, and penalties should be increased for urban enterprises that arbitrarily transfer pollution to rural areas. In rural areas, it is necessary to increase investment in environmental protection funds and talent, make up for the shortcomings in rural environmental infrastructure, gradually narrow the gap between urban and rural areas, and protect the environmental rights and interests of rural residents. For example, in 2008, the central government set up a special rural environmental protection fund for the first time, allocating around 500 million yuan to support 700 villages and towns to carry out environmental improvement and ecological demonstration construction, which attracted nearly 1 billion yuan of investment from all over the world, further benefited more than 4 million farmers^[20]. It also promotes the implementation of a reasonable ecological compensation policy, gradually easing the serious imbalance between rural environmental expenditure and environmental benefits, balancing the distribution of environmental benefits between urban and rural areas, safeguarding environmental justice for rural residents^[21,22], and truly achieving universal, comprehensive, co-construction, and progressive sharing, sharing the fruits of development with urban residents, and lastly enhancing the rural residents' sense of environmental access. The organic integration of rural revitalization and the construction of a green and prosperous countryside with green rhythm, state, and soul is realized^[23].

5. The new eco-friendly and beautiful countryside is an inevitable development picture for rural revitalization

Building a beautiful new countryside that is ecologically livable, and allows the countryside to remember its nostalgia is a reflection of the people's growing needs for a better life and a higher pursuit of the comprehensive value of rural geographical space. The most important thing is to adhere to the harmonious

development of man and nature, green development, coordinated and shared development. In the 14th Five-Year Plan period, the ecological development of Fuzhou's countryside still needs to adhere to the scientific leadership of China's ecological civilization ideology, and firmly grasp the policy advantages of multiple areas overlapping. At present, Fujian is listed as a national pilot ecological civilization zone, a pilot free trade zone, and a core zone of the 21st Century Maritime Silk Road, and is in an advantageous position where multiple zones are superimposed. Therefore, in the combination of rural revitalization and ecological civilization, it is important to firmly grasp the opportunities brought about by this policy advantage. To further develop the rural farming, animal husbandry, and other industries, one should increase investment in the prevention and treatment of rural water, air and arable land pollution, formulate relevant policies and laws, increase the control and punishment of urban waste arbitrarily transferred into the countryside, firmly safeguard rural environmental justice. Additionally, increase the construction-related talents, such as high-level professional and technical personnel, professional and composite personnel, staff familiar with environmental supervision of soil and groundwater, and others, and finally, enhance the consciousness of ecological civilization in all the people. Let the concept of green water and mountains is the silver mountain of gold and the harmonious coexistence of man and nature further penetrates people's hearts. One should firmly promote the green and sustainable development of the countryside, and forming a new situation in which all the people and society as a whole, consciously care, protect, and contribute to the environment, thereby all people can gain a greater sense of participation, rural residents can enjoy a greater sense of access and identity, and all people can share the fruits of development. This study discussed about Fuzhou's countryside as a new type of green, technologically advanced, and livable countryside, providing references for the combination of rural revitalization and ecological civilization construction in China, thereby playing a good leading role as a demonstration.

Disclosure statement

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Analysis on Existing Problems and Counter Measures of Public Health Management in the New Era

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Abstract: With the continuous progress of social development, the people have gradually begun to pay attention to the awareness of life, health and safety, especially in all kinds of sporadic emergencies, which seriously threaten the people's life, health, and safety, thereby forcing the public health management to make timely adjustments and improvements to adapt to the current social development level. In the future, public health management will face more arduous challenges and find a breakthrough in the development bottleneck. At present, there are many factors restricting the development of public health management in China. This paper analyzed the existing problems in China's public health management, and proposed the corresponding improvement countermeasures in order to improve the level of China's public health management in the new period. Additionally, suggestions for the stable development of society, and the construction of a strong public health system were also included in this paper.

Keywords: New period; Public health; Management

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1. Overview of public health management in the new era

Public health management is an important foundation for ensuring national and social stability. It is an important means to effectively deal with emergencies and to ensure people's life as well as health and safety. In the context of the new era, China's economy has developed rapidly and the economic system has changed accordingly, which has also contributed to the development of public health management to some extent^[1]. In recent years, relevant departments have gradually realized the importance of public health management, and actively carried out the construction of the public health system by gradually improving the relevant management systems. However, during this stage some problems in public health management are gradually revealed, therefore, public health management needs to be highly valued by the relevant departments, increase investment in the development of public health management, and effectively improve

the current situation of public health management, to accelerate the healthy and sustainable development of public health management.

2. Existing problems in public health management in the new era

2.1. Weak awareness of public health management

Public health management is closely related to people's physical and mental health. The construction of public health management system is not only construction in the term of infrastructure, but also involve the regulation of macro policies of the management departments. Currently, China's public health management is still in the development stage, and in general the awareness of public health management is relatively weak and the public's initiative to actively participate in the public health management is not strong, especially in the rural areas. People in rural areas do not pay enough attention to the public health management, lack in the corresponding responsibility cognition of public health management, and lack of knowledge and experience in public health management, which may result in the inability to respond quickly to public health emergencies in a timely manner or to provide effective solutions, further restricting the efficiency of public health management ^[2].

2.2. Public health management talents are scarce

Combined with the current level of economic development and the actual situation of China's national conditions, there is a lack of a public health talents with high quality, professional, and management skills, especially in some underdeveloped areas in the Western China. The main reason is probably due to the lack of understanding on the importance of public health management in promoting social development by the relevant departments, where most of the young people and college graduates do not understand and pay attention to this industry, thereby the welfare or benefits of the public health management practitioners are relatively low, resulting in a large number of public health management professionals who have received higher education in this field are unwilling to engage in the relevant professional work after graduation, especially in areas with backward economic development. Additionally, it is impossible to retain talents with public health management ability, and it can be seen that the number and quality of managers will seriously hinder the development of public health management, therefore, enriching public health management talents has become an urgent problem to be solved in China ^[3].

2.3. Lack of standardization in public health management

Public health management is gradually becoming standardize, however, due to the unclear main responsibility may contribute to the multi head management. Where in the long run, this will contribute to some problems in the public health management, such as waste of resources, low efficiency, and unclear objectives. As long as the management subject is clear, the goal of public health management can be truly realized, and the management resources can be reasonably applied. The situation of putting the cart before the horse of 'emphasizing treatment and neglecting prevention' can also be effectively be avoided ^[4]. In addition, China's law also expressly stipulates that once there are omissions in public health management, the person in charge should bear the corresponding responsibility, however, in real society, public health incidents due to management omissions are common. This shows that the person in charge of public health management, were lack in the standardization of health management, where most of the follow-up measures made by the relevant departments are to make up for the previous omissions which may restrict the development process of public health management.

2.4. Slow warning of public health management

In some remote and backward areas, some managers will be driven by their own interests to pay attention

to projects with short-term benefits. In this way, the government's attention to public health management and intervention will be weakened, which may result in unclear management functions of the relevant departments. In addition, there is no strong sense of crisis, where most of the urban and rural areas have not yet built the corresponding early warning systems. Therefore, the early warning of public health management will be slow down and the effective management strategies cannot be made give in a quick manner ^[5]. For example, when a new type of infectious disease occurs in the remote areas, due to the imperfect early warning system the new type of infectious disease is failed to identified, thereby effective response strategies could not be provided, which may result in the rapid and wide-ranging spread of the new type of infectious disease. This will not only seriously endanger the health of local people, but also lead to the passivity of public health management, leading to investment of extra manpower, materials, and financial resources to deal with the emergencies due to slow monitoring and early warning detection ^[6].

2.5. The public health management mechanism is not sound enough

Public health management mechanism refers to the relevant mechanisms which can effectively respond to the public health crises. Specifically, in order to reduce the threat and damage caused by the public health crisis, the relevant departments should formulate the pre-plan mechanism on how to deal with the public health crisis in a timely manner. Therefore, improving and perfecting the plan mechanism can accurately predict the possible subsequent public health crisis events, timely take response measures, carry out disposal work, and comprehensively guide the benign development of public health management. However, at this stage, the public health management mechanism is still not perfect, therefore it is impossible to accurately and quickly predict the upcoming of public health crisis thereby restricting the development process of public health in China ^[7].

3. Effective strategies of public health management in the new era

3.1. Gradually building a public health management system

To improve the effectiveness of public health management, the whole society needs to work together, where relevant departments should give full play to their role in guidance, publicity, and popularization to promote the public to actively participate in public health management, and subsequently gradually build a public health management system step by step ^[8]. However, there are still some disadvantages in public health management, therefore the relevant departments should continue to improve the public health management system to make the public health management more standardized and scientific, to maximized the health of the public, and subsequently to improve the quality of public health management.

3.2. Continuously optimize and improve early warning and monitoring capabilities

In public health management, in order to efficiently solve sudden public health events, it is essential to improve the emergency early warning and monitoring system, which can timely monitor the possible public health crisis, and transmit the crisis information through unimpeded channels, thereby the relevant personnel can identify the crisis problems on time, and subsequently placed corresponding countermeasures to solve the crisis ^[9]. Therefore, emergency early warning and monitoring system and information channel are indispensable. If the system does not sound or smooth enough or the information channel is unblocked, we will not be able to identify the potential crisis on time. In short, relevant departments should pay special attention to the establishment and improvement of early warning and monitoring system, as well keep the information channel unblocked.

3.3. Improve the public health management mechanism

A sound public health management mechanism and plan can assist the relevant departments better in overall

planning, to effectively prevent and carry out the public health crisis disposal ^[10]. Therefore, relevant departments should establish and improve the public health management mechanism and plan, to improve the efficiency of public health management. When improving the relevant mechanisms, we should clarify the responsibilities of various departments, and focus on building a macro-control system of public health management, thereby the clarity and responsibilities of public health management functions can be effectively improved. In addition, the relevant departments should be reasonably allocated and integrate the existing management resources, maximize the advantageous role of management resources, ensure that the plan of public health management mechanism meets the needs of social development, and further protect the physical and mental health of the people ^[11].

3.4. Comprehensively enhance the consensus of public health management

In order to improve the efficiency of public health management, one should comprehensively improve the consensus of public health management. Firstly, it is important to improve the ideological understanding of the managers, break the traditional ideological imprisonment, and improve the deficiencies in management behavior, thereby the level of public health management can be significantly improved. Due to the lack of ideological understanding of managers, the people will also have obvious deficiencies care or knowledge in public health. Secondly, while improving their ideological understanding, managers should also publicize public health knowledge to the public ^[12], where during publicity specific and feasible plans should be formulated, and should not leave the publicity work on the surface. The publicity can be conducted with the help of new media and other methods which are familiar to the public. In this way, the attention of the people in public health management can be quickly improved, therefore the public health events can be effectively prevented. In addition, it is also essential to improve the publicity mechanism, and strengthen the people's understanding of public health, so that managers can carry out the public health management better in the later stage ^[13].

3.5. Establish and improve the scientific crisis management mechanism

For public health management, it is necessary to actively build a perfect and scientific crisis management, which may help to deal with all kinds of public health emergencies, and effectively ensure the safety of people's lives and property. In this regard, we can start from the following aspects; (1) A crisis response material support mechanism should be built. In public health management, good material reserve is an important guarantee to deal with sudden public health events. Therefore, in order to effectively improve the effectiveness of public health management, relevant departments should do a good job in the storage of medical equipment, instruments, drugs, and other materials. On this basis, they should establish a perfect production, mobilization, distribution, and supervision system of crisis response materials, improve the construction of relevant database, and fully grasp the storage of relevant materials to ensure the effectiveness and efficiency in the later use ^[14]; (2) Should perform a good job in the construction of crisis management team. In public health management, good management team construction is essential. Combined with the actual situation, in the process of public management, especially when dealing with some sudden public health events, a large number of professional personnel are needed. In reality, it is often difficult for us to transfer enough personnel to manage public health practice at the first time, which also reflects the problem of insufficient construction of crisis management team in the current public health management ^[15]. In this regard, based on their own work, we should actively build a crisis management team from the perspective of possible public health events and problems, and build an independent and perfect crisis personnel team to achieve the goal of preventing in the real sense. A scientific and perfect crisis management team should include, the professionals and leaders in information management, financial management, personnel management, administrative management, legal management, public security, and

other aspects. Additionally, we should absorb professional personnel, where leadership systems with strong working ability and affinity to effectively coordinate the smooth operation of relevant work should be implemented ^[16]. On this basis, the crisis management team should also combine the internal actual situation and start from the perspective of specific work to clarify the relevant work processes and mechanisms, to ensure that when dealing with specific public health management events in the follow-up, it can be scientific and efficient, and comprehensively improve the quality and efficiency of public health management.

3.6. Effectively strengthen the government's leading governance capacity

At this stage, China's government governance capacity has a certain lag, therefore we must strengthen the government's leading governance capacity. We can start from the following points; (1) The government should actively change its functions. As a government in the new era, it should be a responsible government, a service government, a limited government, and a government under the rule of law. In this regard, the government must clarify the market boundary, and the government also should fundamentally change its functions, and gradually shift its focus to public services. In this way, the government can have sufficient ability and awareness to deal with public health events ^[17]; (2) The government should build a management system of horizontal allocation of functions and vertical division of powers, to gradually refine the powers of public health management, optimize, and clarify the responsibilities of relevant government departments at the same level, and try to avoid overlapping functions, to maximize the efficiency of public health management; (3) The government and its relevant departments should improve the ability of staff to manage the public health. Public health management has a high demand for talents. Therefore, when selecting public health management talents, personnel of relevant majors should be selected according to their post-responsibilities, to improve the professional ability of the managers ^[18]; (4) We should strengthen the construction of Grass roots organizations. Grass roots health management is more specific and has a large workload, where Grass roots organizations play a key role in dealing with some sudden public health events ^[19]; and (5) The ability of government personnel to deal with the media should also be effectively improved. The society pays more attention to some unexpected public health events, which are sensitive. In this regard, the government should be realistic in preparing the press conference, to enhance the credibility of the government.

4. Summary

In China, there are existing problems in public health management at this stage, such a lack in the awareness of managers, the inefficient emergency early warning system, and the lack of corresponding crisis management mechanism, which seriously restrict the work efficiency of public health management. Therefore, further improving the public health management mechanism, the emergency early warning and monitoring system, and the ideological understanding of managers, and building a public health management service system are the most effective measures to speed up the efficiency of public health management.

Disclosure statement

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Discussion and Implementation of Ideological and Political Construction of Chemical Engineering Courses: Polymer Characterization and Testing as an Example

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Abstract: Curriculum ideological and political construction is a novel requirement and concept of the current curriculum colleges and universities' teaching reform. As the undergraduate core course majoring in Polymer Materials and Engineering, the course of Polymer characterization and Testing has updated their teaching concept, and introduces ideological and political elements in their course to keep pace with the time. Firstly, it expounds the necessity of performing ideological and political education in the new engineering professional curriculum, and then introduces the implementation status of the curriculum ideological and political education. Secondly, the professional curriculum framework system and the teaching content were combined, and it deeply excavates the strategies and methods of the curriculum ideological and political education. Thus, the experience for the ideological and political construction of the professional curriculum under the background of the new engineering was provided.

Keywords: New engineering specialty; Professional courses; Ideological and political construction; Talent training

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1. Introduction

In September 2018, a view was pointed out at the National Education Conference where “To serve economic and social development, we must improve the ability of education, and try our best to cultivate innovative, compound, and practical personnel ^[1].”

The “New Engineering Specialty” is the reform direction of higher engineering education, where it is proposed for the development of emerging industries based on national strategic planning, in combination with the trend of international competition ^[2,3]. The new engineering specialty focused on the development of new technologies, new business forms, and new industries, further establishing morality and cultivating people as one of the criteria. In addition, there is a need for new requirements in the professional technology and creative ability of engineering talents in the new era. The construction of ideological and political curriculum is a new ideological and political work, which integrates the concept and practice of talent training and education. Professional courses should be combined with ideological and political curriculum with professional teaching knowledge, and course practice guidance and course task completion, to realize the whole education process. Based on the teaching practice of Polymer Characterization and Testing, and the trend of teaching reform, this paper used a novel teaching mode by integration professional courses

with ideological and political education.

2. The necessity of integrating ideological and political education into new engineering courses

2.1. The need of implementing education of building morality

The fundamental purpose of talent training is to establish morality and cultivate people ^[4,5]. Most teachers, in their daily teaching work, often pay attention to the teaching of professional knowledge and try their best to teach professional skills and application abilities, however, there are rarely involved the ideological and political elements in their teaching content. The ideological and political construction of professional courses should not only impart professional knowledge, but also should integrate the value orientation and use professional advantages to achieve the ideological and political guidance of students, to achieve the overall goal of socialist core values ^[6].

2.2. The need of strengthening the construction of new engineering specialty

Building a new structure and new connotation of disciplines and specialties is the goal of the construction of new engineering specialty. This structure should combine the characteristics and advantages of modern and traditional engineering ^[7-9]. As the main implementer of talent training, teachers may combine curriculum ideology and politics in the process of talent training. Additionally, all courses are designed to have their own function in educating people, similarly in the professional course of Polymer Characterization and Testing in the context of the new engineering. Engineering courses focus on the cultivation of professional knowledge and engineering practice ability, and the ideological and political factors which are contained in the course itself seem to be difficult to be integrated and implemented. Therefore, college teachers should be fully familiar with their professional knowledge, explore relevant ideological and political elements, realize ideological and political courses, and complete the teaching construction and reform of ideological and political courses.

2.3. The need of students to follow the growth and development of present time

The comprehensive goal of cultivating talents with high moral quality in colleges and universities, and the key period of improving the qualities in college students is the stage of learning in school, where during this stage, students' life, world, and values outlook are truly formed ^[10,11]. For a long time, professional teachers believe that cultivating students' professional skills is the primary task of professional courses, meanwhile educating people is the task of ideological and political courses. Therefore, while imparting professional knowledge, teachers should not only follow the growth law or notice the growth of the students, but also should actively guide the students to ensure that the previously mentioned three outlooks are formed in the students, and they have the courage to take responsibility.

3. Education and teaching status of ideological and political building of professional courses

3.1. The teaching teachers do not have a deep understanding of the curriculum ideology and politics

The process of student education, professional ability, and ideological and political building are equally essential and closely related. Due to the construction and development of today's colleges and universities, young teachers who have just graduated are forced to undertake the teaching tasks, however, they have not received professional education and teaching training, thereby their ideological and political level only stays at the relevant education level received by the school ^[12]. As a student, their ideological and political education in school is limited, thereby they do not have a deep understanding of the relevant concepts and detailed connotation of ideological and political construction. Further, they may misunderstand the ideological and political education, and think that ideological and political construction has no effects on the social and economic development.

3.2. The teaching method of teachers' ideological and political education is simple

Many professional course teachers follow a simple teaching method, therefore teaching methods unable to adapt to the current need. When they teach professional knowledge, the teachers only explain the basic knowledge according to the content of the courseware, in return the student record the teaching content of the course. Therefore, the students' thinking is easily become tired, limited, and stagnant. Students' active participation in the teaching process is obviously insufficient, and easy to decreased the students' interest in listening, listen carelessly or even unwilling to listen. Obviously, such an old teaching model, even if it used to introduce the ideological and political content of the curriculum, it could not achieve the profound education of students' ideological and political aspects.

3.3. Students attending the class are lacking interest in ideological and political education

The fundamental purpose of ideological and political construction in the professional courses is to promote the overall development of the students. However, at present, the establishment of curriculum ideological and political education is still in the initial development stage, and there is insufficient understanding of the value and application of the curriculum ideological and political education. In real life, it is difficult for students to find the connection between ideological and political knowledge, professional skills, employment, and further study. Thereby the students assume that the ideological and political construction and professional ethics are empty words, therefore they are not interested in learning.

4. Reform and strategy of ideological and political building of professional courses

4.1. Reform approaches

4.1.1. Constructing an education and training system of curriculum ideological and political

To guide the teachers to conduct the ideological and political construction in depth, we need to build a comprehensive and reasonable curriculum of ideological and political construction system. In the course of ideological and political construction, it should not only focus on the top-level design of colleges and universities, but it also should involve the internal staff of colleges and departments, and finally implemented it in the actual teaching activities of front-line teachers. Colleges and universities may perform different types of curriculums ideological and political work training for professional teachers, subsequently guide the teachers to actively develop ideological and political teaching exchanges and discussions.

4.1.2. Building a contingent of teachers with high ideological and political level

Continuously improving the overall quality of the teachers, and cultivating high-level teachers are the key problems to be solved in higher education in China. In order to improve students' professional knowledge level, relevant practical skills, and corresponding ideological and political level, we need a team of teachers with both political integrity and ability. In addition to the professional level suitable for professional development, which meets the requirements of the present time and career development, teachers also need to systematically master their basic knowledge and principles of the Communist Party of China, learn to observe and find a solution with the Party's positions, viewpoints, and methods ^[12].

4.1.3. Forming an evaluation and assessment mechanism related to ideological and political construction in professional courses

The important means in testing the effect of curriculum ideological and political work, is by establishing the evaluation mechanism of professional curriculum ideological and political education. When conducting the ideological and political education in the professional courses, the teachers should accurately construct

the teaching objectives, requirements, and contents, as well as diversified curriculum assessment and evaluation mechanisms [8,11]. In the evaluation and assessment mechanism, one should not only comprehensively and objectively reflect the students' real learning ability based on the professional knowledge, but also comprehensively reflect the students' ideological, moral level, and professional quality at the same time.

4.2. Specific strategies

4.2.1. Adjusting curriculum training objectives

Implementing morality and educating people is the ultimate goal of education and teaching system. Teachers should, initially should adjust the curriculum training objectives, and combine the ideological and political education with professional curriculum teaching [11,13]. After the adjustment, the teaching goal of Polymer Characterization and Testing is to enable undergraduates to master the basic concepts and principles of polymer material structure and performance through course learning, and be able to explain the complex engineering problems of polymer materials according to the basic principles of material structure analysis, and this may lay a certain foundation for the research of material physical and chemical structure.

4.2.2. Revising course syllabus

Cultivating professional and technical talents and improving students' professional skills is the basic objectives proposed in the syllabus of Polymer Characterization and Testing. The ideological and political education elements are rarely involved or included in the outline [11], therefore, for the sake of enhancing students' ideological and political education, as professional curriculum teachers, we should first introduce the ideological and political elements, revise the curriculum syllabus and supplement, and lastly improve the talent training objectives. For example, during the teaching process of infrared spectrum testing method, the teachers can introduce the reform of relevant scientists in the relevant testing methods and equipment, which can fully show the new atmosphere brought by the progress of science and technology, also the prosperity of society and the country.

4.2.3. Improving the course teaching methods

At present, the course of Polymer Characterization and Testing mainly teaches the characterization methods, and testing means of polymer material structure. In addition, the course focuses on the combination with the times, the transition from basic knowledge to new material representation cases, and the transition from traditional methods to newly emerging technologies. However, there is a lack of relevant content of ideological and political construction in the curriculum system. Therefore, multi-media teaching means and various teaching methods, including typical cases, interactive discussion and reporting on the podium, should be used to transmit the knowledge to students through multiple channels, forms, and vivid images [11].

5. Conclusion

In summary, combining the ideological and political education with professional curriculum, teaching is a very arduous task, however, it is very meaningful and necessary. To perform ideological and political education in Polymer Characterization and Testing, we should realize the dual tasks of explicit professional knowledge learning, and implicit ideological and political education in promoting the improvement and development of students' various abilities and qualities. In this process, teachers should use the professional knowledge and skills of the course, as well as the ideological and political moral quality and literacy as the training objectives, and realize the educational effect of enhancing morality, and teach the student in a silent

way. In short, professional teachers should adhere to the socialist core values of the new era, guide the students to study majority knowledge, and form correct values, thereby the student can become builders, and successors of the socialist causes.

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Author contributions

J. W. is responsible for writing the paper; T. G. is responsible for literature retrieval; R. W. is responsible for checking the paper.

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Forecast of Logistics Demand in the Pearl River Delta Region Based on PCA-GA-SVM Model

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Abstract: Regional economic development is highly correlated with the change of regional logistics. This paper selects the freight volume as the representative index to reflect the development of regional logistics, and constructs the prediction index system of regional logistics demand. Accordingly, the principal component analysis method is used to reduce the data dimension of the prediction index, and the complexity of the prediction model. Further, the support vector regression model is optimized by genetic algorithm which is constructed by using the advantages of support vector machine algorithm in dealing with nonlinear and small sample size problems. The empirical analysis shows that the prediction model based on PCA-GA-SVM has very good prediction accuracy, it can provide valuable reference for regional logistics development and management.

Keywords: Regional logistics; Principal component analysis; Support vector regression; Genetic algorithm

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1. Preface

Regional logistics and economic development are inseparable. On the one hand, the large-scale and modern development of regional logistics not only provides sufficient power for regional economic development, but also helps to enhance industrial advantages, and promote the high-quality development of regional economy. Additionally, the sustainable development of regional economy also provides a solid foundation for the healthy development of the logistics industry. Further, the optimization and upgrading of the economic and industrial structure respectively, are conducive for the rapid development of the emerging logistics industry, leading to gradual developed of the logistics industry into a new economic growth point. At present, the research on the development of logistics industry has attracted much attention, especially in the fields of logistics theory research, logistics model, and logistics technology innovation, which has made considerable achievements, providing an effective basis for the development of the logistics industry, and the decision-making of logistics management departments. Based on the high correlation between regional logistics and economic development, this paper forecasts the development status of regional logistics through regional economic indicators, realizes the scientific and accurate prediction of regional logistics demand, and provides a reliable quantitative basis for regional logistics management and development planning.

2. Literature review

At present, the research on regional logistics demand forecast is mainly reflected in two aspects; (1) To use logistics data itself to predict the logistics demand, including logistics demand forecast in specific regions

and fields ^[1-6]; (2) To use regional economic data to predict the logistics demand ^[7-13], including the logistics demand forecast as a regression problem, and drawing lessons from the prediction method in the field of economics of logistics demand forecast research, by building a prediction model, study the relationship of regional economic development and the quantity of logistics demand, analyze the influence of regional economic development on the development of logistics, and subsequently obtained certain research results.

Due to the short development time of China's logistics industry, there is relatively lack of logistics statistical data, however, there are many economic indicators that may affect the logistics demand, therefore, in the actual research it is necessary to ensure the accuracy of prediction model. Secondly, the index system of the model should not be too complex, lastly less amount of indicator data should be sufficient for the model development. Combining with the existing research foundation, this paper firstly uses the principal component analysis method to reduce the data dimensionality of the predictive index system to reduce the complexity of the model, and then uses the support of vector machine model, which is optimized by the genetic algorithm to solve the problems of small sample size and nonlinearity, thereby can effectively meet the above forecast requirements.

3. Prediction model construction

3.1. Construction of predictive index system

According to the close relationship between regional economy and the regional logistics, through correlation analysis, and integration with the availability of index data, the economic indicators which are selected in this paper includes; Gross domestic product, industrial output value, agricultural output value, tertiary industry output value, fixed asset investment, regional total retail sales, regional total foreign trade, per capita disposable income, and the forecast index is freight volume. In contrast, macro policy, logistics service level, transportation network, and other factors are not considered, due to the difficulty to quantify these statistical indicators, additionally these index data are difficult to obtain.

3.2. Principal component analysis (PCA)

Principal component analysis (PCA) is a statistical method which is used to reduce dimension. With the help of orthogonal transformation, the original variables are recombined into a new group of several linear unrelated comprehensive variables. At the same time, it can capture few comprehensive variables and reflect the information of the original variables as much as possible. Therefore, PCA can effectively reduce the dimension of the data space studied, subsequently, reduce the complexity of the predictive index system.

3.3. Support-vector regression model (SVR)

The kernel method originates from statistical learning theory, mainly applied in the field of pattern recognition, and it's largely used is to find and learn interrelations in a set of data, which is an effective way to solve the problem of nonlinear pattern analysis. Support vector regression is a classical model of nuclear methods, which performs well in nonlinear small sample size and nondeterministic data, and has a wide application prospect in the complex nonlinear prediction and comprehensive evaluation ^[6]. More importantly, SVR aims at the minimization of structural risk, and achieves a good balance between the degree of model learning, and the generalization ability of the model, which effectively improves the shortcomings of other nonlinear intelligent algorithms.

3.4. Genetic algorithm (GA)

Genetic Algorithm originated in computer simulation studies on biological systems. It is a stochastic search algorithm that draws lessons from natural selection and natural genetic mechanisms in the biological community. Unlike conventional algorithms, genetic algorithms do not rely on the gradient information,

but search for optimal solutions by simulating natural evolutionary processes, which use some coding technology, and act on digital strings called chromosomes to simulate the evolutionary process of groups composed of these strings. Genetic algorithm has many advantages, such as the universality of feasible solutions, do not need auxiliary information, internal heuristic random search characteristics, not easy to trap local optimal, using the natural evolution mechanism to show complex phenomenon, can quickly and reliably solve the very difficult problem, has inherent parallelism and well computing ability, have scalability, easy to mix with other techniques, and others [6].

3.5. The PCA-GA-SVM prediction model

The support vector regression model achieves good statistical laws and better generalization ability with small statistical sample size, however, there are also some shortcomings; (1) Since training the SVM needs to solve the quadratic programming problems, when the number of training samples and the indicator dimensions is large, the operation time of the model will become longer; (2) The selection parameter of the support vector machine. Since the selection of the penalty coefficient and kernel functions in the model has a great influence on the predicted results, the current common practice is to combine the personal experience, and use the method of trial and error to determine the parameters of the model. Due to the lack of systematic theoretical guidance, this processing method has a certain degree of subjectivity, which leads to deviations in the predicted results. In order to solve this problem, a genetic algorithm is introduced in this paper. With the help of the powerful global search ability of the genetic algorithm, the parameters of the support vector machine regression model are genetically encoded and searched globally by using the real number coding method. As the final parameters of the support vector regression model, the specific algorithm flow is as follows:

- (1) Use principal component analysis to reduce the dimension of sample data, and extract principal component information according to the cumulative contribution rate of eigenvalues.
- (2) Initialize the value range of support vector regression model parameters (penalty coefficients and kernel parameters).
- (3) Initialize the individual parameters of the genetic algorithm, and randomly generate M chromosomes according to the real number coding method to generate the initial population P(t) of the genetic algorithm.
- (4) According to the gene sequence of the chromosome bit string, the selected factor combination set is obtained according to the selection strategy.
- (5) For each individual in the initial population, the support vector regression program is used to calculate the predicted output value corresponding to the target value of the training sample, the misclassification rate of the training sample can be calculated, and finally the individual fitness value of the chromosome can be obtained.
- (6) Execute M cycles to complete the calculation of the fitness value of each individual in the initial population.
- (7) Perform selection, crossover, and mutation operations to form the next generation of subpopulations.
- (8) For the optimal individual in the new population, the grid search method is used to search its nearby area, and the optimal individual is replaced by the searched parameter combination.
- (9) Execute the iteration termination criteria, and stop it if the iteration termination conditions are met; otherwise, change the child to the new parent, and go to step 5 until the iteration termination conditions are met. At this time, the optimal individual in the population is the solution of parameter inversion.
- (10) Using the obtained combination of optimal parameters (penalty coefficient and kernel parameter), substitute it into the support vector regression program in step (2) to predict and analyze the data.

4. Empirical research

4.1. Data collection and preprocessing

The data used in this paper obtained from the Statistical Yearbook of 9 cities in the Pearl River Delta of Guangdong Province (1990-2020), of which the data from 1990-2015 is used as training data to determine the parameters of the model, and the data from 2016-2020 is used as test data for Test the predictions of the model.

Due to the different dimensions and large differences in the values of each prediction index, before applying the data, the original data was initially standardized, then the sample data is converted into the interval [0,1], to eliminate the impact of dimensional differences on the comparability of sample data. The data conversion formula is as follows:

$$T = \frac{X - X_{\min}}{X_{\max} - X_{\min}}$$

In this formula, X represents the original data; X_{\min} represents the minimum value of the original data; X_{\max} represents the maximum value of the original data; and T is the transformed data.

4.2. Indicator correlation analysis and data dimension reduction

Firstly, SPSS software was used to analyze the correlation between independent and dependent variable in the prediction index. It was found that the correlation coefficients of independent variable and dependent variable were all over 0.93, indicating a significant positive correlation. In addition, there is also a high degree of autocorrelation among the 8 independent variables, and the correlation coefficients are all higher than 0.90, indicating these variables may exist multicollinearity as independent variables in the regression model. Therefore, in order to ensure the prediction effect of the model, dimension reduction should be conducted on the sample data initially to reduce the mutual interference and influence among indicators. In this paper, PCA was used to reduce the data dimension. With 90% cumulative variance contribution rate as the selection standard, the first and second principal component indexes were selected to replace the original 8 input indexes, which not only reduced the complexity of the index system, but also improved the prediction accuracy of the model.

4.3. Model training and testing

Firstly, to initialize the model parameters; 3-e-SVR is used as the type of support vector machine; The radial basis (RBF) kernel function is used as the kernel function; The value range of the penalty parameter C is [0, 100]; and The value range of the radial basis kernel function parameter is [0,100]. The maximum evolutionary generation of the genetic algorithm is 300, the maximum population is 40, the crossover probability is 0.3, and the mutation probability is 0.01. Then use the data from 1990 to 2015 for training, and the model calculates a stable iterative value of the best fitness after 300 iterations. The result is shown in **Figure 1**.

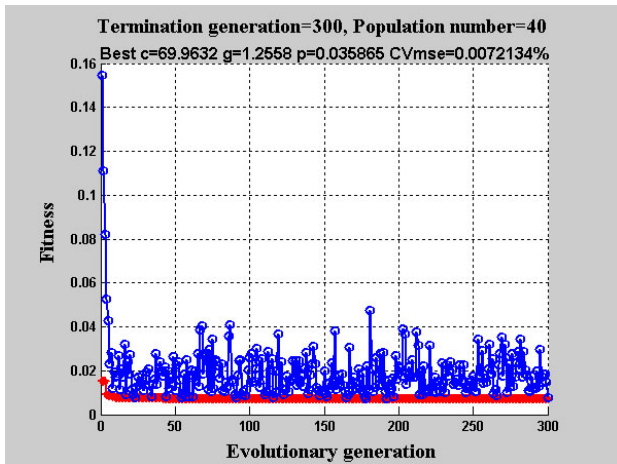


Figure 1. Fitness curve

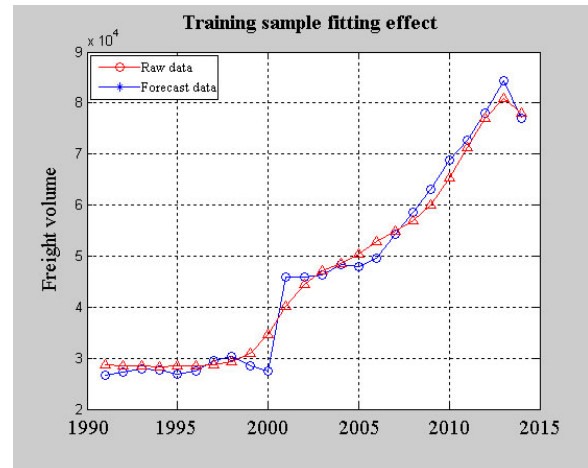


Figure 2. Training sample fitting effect

Figure 1 showed that, after the optimization and selection of the genetic algorithm, the penalty parameter C of the support vector machine model is 69.9632, and the value of g is 1.2558. At this time, the minimum mean square error of the training set is 0.0072134%. Then substitute these two parameters into the SVM model for calculation, and the training results of the training data set are shown in Figure 2. It can be seen that the SVM model with optimized parameters has an ideal fitting effect on the sample data, except for individual samples, the forecast data of other years are basically the same.

In order to verify the superiority of the PCA-GA-SVM model with the unchanged experimental data, the standard SVM and PSO-SVM models were used for prediction, and compared with the predicted results of the PCA-GA-SVM model, the results are shown in Figure 3 and Figure 4 for prediction effects and prediction error, respectively.

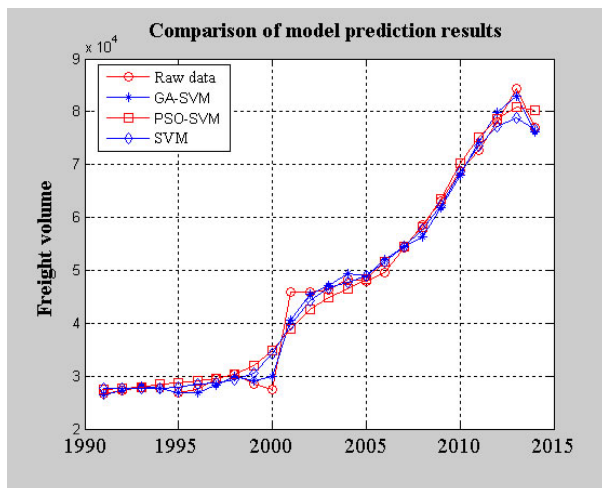


Figure 3. Comparison of the prediction effects

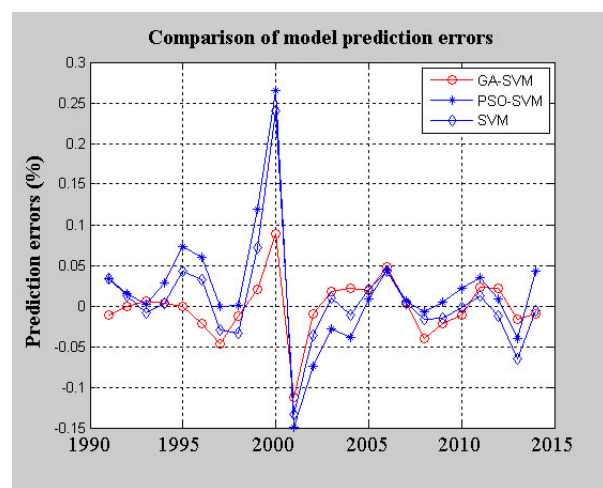


Figure 4. Comparison of the prediction error

Combining with Figure 3 and Figure 4, it can be seen that the PCA-GA-SVM model has more advantages in prediction accuracy, better fitting effect for nonlinear data, and better compatibility with outlier data compared to the standard Svm and Pso-Svm models. In order to accurately calculate the sample training error values of the three models, this paper uses the average relative percentage error to evaluate the prediction performance, as shown in Table 1.

Table 1. Prediction error

Method	PCA-GA-SVM	PSO-SVM	standard SVM
Average error	2.45%	5.61%	4.74%

It can be seen that the error of the PCA-GA-SVM model is the lowest, and its prediction error fluctuation is also the smallest. The main reason is that the model uses the global optimization ability of the genetic algorithm to search for the optimal penalty parameter C and kernel function, in contrast these parameters cannot be achieved using the traditional Svm and Pso-Svm model.

The trained model is used to predict the logistics demand from 2016 to 2020, and compare it with the raw freight volume to test the actual effect of the model, and the results are shown in **Table 2**.

Table 2. Model prediction error

Raw data	81023	93318	94376	91535	90341
Forecast data	80023	91347	95854	90064	87972
Prediction error	1.25%	2.16%	-1.54%	1.63%	2.69%

As shown in **Table 2**, the average prediction error of the model is below 2%, and the accuracy is very high, indicating that the model not only has a good fitting ability to the training sample data, but also has a very strong generalization ability to the test sample data, therefore, the model can be used to forecast the freight volume in the Pearl River Delta in the short term.

5. Conclusion

Based on the close relationship between regional economy and logistics, this paper constructs a PCA-GA-SVM regional logistics demand prediction model according to the characteristics of logistics data. The empirical analysis shows that the model has higher prediction accuracy, and its prediction results are better, compared to the standard SVM and PSO-SVM model. In addition, the PCA-GA-SVM model can realize the accurate prediction of logistics freight volume in the short term, thus providing an effective reference for the management decision-making of the logistics management department.

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Constraints and Optimization Paths of Female Migrant Workers' Employment

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Abstract: The employment of migrant workers has always been a hot topic, and it is a difficult problem that is should be urgently solved in China. Female farmers are one of the most special members of the migrant worker group. Due to the social concepts and their physiological characteristics, female migrant belongs to a vulnerable group in the job market. Under the predicament of unequal basic resources, difficulty in protecting the labor rights and interests, and multiple roles, the living and survival pressure of female migrant workers have become heavier. Therefore, the optimization of the employment of female migrant workers should be initiated. The paper, discusses the issues related to the female migrant worker's employment.

Keywords: Female migrant workers; Employment; Human capital

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1. Employment status of female migrant workers

According to the Monitoring Survey Report on migrant workers released by the National Bureau of Statistics, before the outbreak of the new crown epidemic, the total number of migrant workers showed a slow upward trend from the year 2010 to 2019, with total migrant workers was 290.77 million, an increase of 48.54 million in the year 2010. From the year 2015 to 2019, the proportion of female migrant workers, compared to the total number of migrant workers rose from 33.5% to 35.1%, an increase of 1.6%. The above changes are due to the main social contradiction in the country, which has been transformed into the contradiction between the people's growing needs for a better life, unbalanced and insufficient development. The rise in prices has led to the meager income obtained from the agricultural production is no longer sufficient to meet the requirements of the people. Due to the needs, economic pressure, and the pressure of life forces more farmers and more rural families to go out to work to meet the needs of their family life. Therefore, there has been a continuous increase in the number of migrant workers, especially an increase in the proportion of female migrant workers in recent years.

Under the dual pressure of the world's unprecedented changes and the epidemic of the century, stabilizing employment is a major task in China at present. As a key group of migrant workers who move between urban and rural areas, their employment status is often affected by the economic and social environment. They are the vulnerable group in the urban job market, while female peasant workers are the most unique part of the migrant worker group. Compared with male migrant workers, female migrant workers are objectively and physiological differences, thereby they suffer from multiple pressures, such as gender discrimination, therefore the female migrant workers in cities belong to a most vulnerable group among all other vulnerable groups ^[1]. At present, female migrant workers are facing many difficulties in

during their employment, therefore paying attention to the employment of female migrant workers could help in maintaining the social fairness and justice ^[2]. This paper takes the female group of migrant workers as the research object, studies the restrictive factors in their employment, and proposes few solutions.

2. Constraints on the employment of female migrant workers

2.1. Inequality of basic resources

The process of female migrant workers looking for a job can be regarded as the process of matching the human capital and external material capital of individual female migrant workers. A female migrant worker who has more knowledge and stronger abilities, will have the opportunity to find jobs with better wages, on the contrary, it will be difficult for them to find a job with a relaxed working environment and good treatment if they are lack of knowledge and abilities. Due to the financial difficulties of many rural families and the deep influence of traditional patriarchal ideology ^[3], more attention is given to the boys' education, compare to girls, especially for rural families with a large number of children and greater living pressure, where they generally choose to give priority to the education of boys, thereby ignore the education of girls ^[4]. Therefore, among the migrant workers, the number of male migrant workers and the average number of years of education are generally higher than those of female migrant workers ^[5]. In addition, due to a series of chain reactions caused by the dual urban-rural household registration system, migrant workers are treated unfairly compared with urban household registration workers in terms of enjoying employment guidance, skills training, and other opportunities ^[6]. Further, the service network has not yet been popularized in some towns and remote mountainous areas, and the government's work related to the employment services in remote rural areas has not been fully implemented. Therefore, female peasant workers are at the most vulnerable group among the disadvantaged groups. Moreover, compared with male peasant workers or urban household registration labor groups, female migrates worker often faces the dilemma of unequal access to basic resources, such as education and training. With the improvement of personal human capital, female migrant workers often only able to engage in low-skilled jobs with relatively poor wages ^[7].

2.2. Difficulty in protecting labor rights

As a profitable economic organization, the fundamental driving force for supporting the business activities of an enterprise is to pursue the maximization of economic benefits. Although the national law strictly stipulates that recruiting units must sign labor contracts with workers, female migrant workers often move in a pendulum-like manner between urban and rural areas due to their family and personal reasons, thereby mostly engage with informal employment, flexible employment, and poor employment stability, where there are great difficulties in term of labor relations. To reduce the costs, some enterprises tend to exploit the loopholes in the law, additionally, some enterprises who hired female migrant workers, often failed to sign labor contracts or sign unfair labor contracts, and try their best to avoid purchasing maternity insurance, medical insurance, pension insurance, and social insurance for the female migrant workers. Therefore, the legal rights and interests of female migrant workers cannot be effectively guaranteed. Further, the working conditions of some female migrant workers are extremely difficult and harsh, especially those female migrant workers who work for a long time in an environment that is harmful to their health, which may subsequently affect their future fertility, and the health of their offspring, in conjugation with this, female migrant workers' health damage caused by work is often reported in newspapers ^[8]. Additionally, the phenomenon of unequal pays for given work load, is also very prominent in female migrate workers, which is often caused by gender discrimination ^[9]. However, due to their low education level, female migrant workers have weak or low legal and rights protection awareness, further when their rights and interests are violated, they are in a state of ignorance or they know that the company has not fulfilled its responsibilities, however, they choose to turn a blind eye because afraid of losing their jobs or sources of income. Further

laissez-faire companies are allowed to evade their responsibilities.

2.3. Multiple roles are heavy

The main social contradiction in our country has been transformed into the contradiction between the people's growing needs for a better life, and unbalanced and insufficient development. The rise in prices has led to the meager income from agricultural production, which is no longer enough to meet the needs of the rural families. Therefore, the family's economic and living pressure have forced them to go out to work to full-fill the needs of family life, leading to increase in the burden on female migrant workers.

Since the ancient times, in China there has been the idea of males take charge of the outside work, while females take charge of the inside work. However, due to the increasing pressure of family life, rural women need to go out to work to share the family's economic pressure, at the same time need to take care of the family's internal affairs. Married female migrant workers have multiple roles such as laborers, mothers, and wives at the same time. The first task of female migrant workers is to shoulder the responsibilities of mothers and wives, and take care of husbands and children, further support the elderly and take care of family-related work. Female migrant workers often face special periods such as childbirth and breastfeeding when working, if necessary, they will choose to interrupt their current work to meet the needs of their families and children, that is why it is impossible for female migrant workers to be like male migrant workers. Working in the same job or staying in the same post, the dedication to choosing flexible employment and short-term employment for the family and children has subjectively contributed to the unstable work among the female migrant workers, and also led to many problems or hindering their job promotion. In short, the multiple roles and responsibilities played by women are the important reason why the female migrate worker unable to continue their work in the same job or place for a longer time. The contradiction between family and workplace has also become a major dilemma in the employment process of female migrant workers.

3. Path selection for ensuring employment of female migrant workers

3.1. Solving the “ideological baggage” of employment

For female migrant workers to be relieved from worries, and devote themselves to work, it is essential to solve the problem of their children's education and basic security. Firstly, when female migrant workers leave to work outside their hometowns, the relevant government departments should fulfill their corresponding responsibilities by guarantee the left-behind or the female migrant workers' children's right to receive the basic education, and take the initiative to perform a good job in educating the children of migrant workers. Secondly, for the female migrant workers who come to cities to work, government departments should solve the problem of basic living security for them, for example increase the number of public rental housing for migrant workers, appropriately broaden application conditions, and simplify the employment application procedures. Thirdly, due to the characteristics of flexible employment, and low employment stability of female migrant workers, the local government should establish a social assistance policy which is linked to the employment place, and provide basic living guarantees for the female migrant workers who are temporarily unemployed or encounter sudden difficulties, as much as possible to solve the psychological burden of their off-site employment.

3.2. Increase opportunities for self-improvement

Human capital is the key factor in the employment of female migrant workers. Education and training can enhance the human capital stock of female migrant workers, and increase their competitiveness in the labor market. Therefore, government departments should strive to change the old generation's concept of “useless reading,” “priority for sons,” and other ideas, in return increase the investment in educational resources in

rural areas^[10]. Firstly, it is essential to ensure the people in poor rural areas receive basic education through preferential policies and funds, additionally increase the publicity of the student loan policy, therefore the idea of “reading changes one’s destiny” can be deeply rooted in the body and mind, and further encourage more people to study even though family with the poor economic condition. Secondly, the government should increase the employment services and skills training, and develop targeted employment guidance and skills training according to the characteristics of the female migrant workers^[11]. Employers should also appropriately provide female migrant workers with re-learning opportunities to improve their professional skills and knowledge. Thirdly, it is important to moderately expand the vocational education of the female migrant workers. General education, such as special types of vocational education and training should be developed based on the knowledge, vocational skills, and corresponding work abilities which are required by the female migrant workers in their daily work. Additionally, enhance the ability of female migrant workers to adapt to the urban labor market.

3.3. Create an environment of fair employment

Due to the binary segmentation of the labor market, the female migrant workers faced discrimination in employment opportunities and treatment. Additionally, the female migrant workers also belong to the group of female laborers, therefore, face gender discrimination in the labor market. To optimize the employment status of female migrant workers, it is important to create a fair employment environment, eliminate gender discrimination in the job market, and promote employment equality. Firstly, in terms of legislation, it is necessary to effectively protect the rights and interests of the female migrant workers, and further improve the labor law and labor contract law to fill-in the legal loopholes. Secondly, one must be responsibility when implementing and supervising, further do a good job in the implementation and enforcement of the relevant provisions of the Employment Promotion Law to protect the rights and interests of female migrant workers, strengthen the supervision of employers, and eliminate gender discrimination in employment from the intermediate links itself. Thirdly, the female migrant workers themselves should try to reduce or prevent the possibilities of their rights and interests being violated. Through education, publicity, and other means, try to strengthen female migrant workers’ awareness of their rights, strengthen the legal concept of female migrant workers, and advocate female migrant workers to use legal means to protect their legitimate rights and from being violated.

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Disclosure statement

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Chemical Change and Quality Control in Winemaking

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Abstract: Wine is an alcoholic beverage made from grapes that are greatly consumed in the modern society. Winemaking also known as vinification, is a process of converting fruit juice, in particular those from grapes into wine through the process called fermentation. The winemaking process involved many chemical changes, such as alcoholic fermentation, and malolactic fermentation (MLF). Microbiota which is used in the winemaking has great impact on the quality of wine, additionally, may cause negative attributes to some type of wines. Therefore, the modern wine industry tries its best to pay more attention to some critical quality control points to avoid off-flavors, and aim to produce wines with pleasant tastes with healthy substances, such as wine with antioxidant properties.

Keywords: Chemical change; Fermentation; Sulfur dioxide; Maturation of wine; Antioxidants

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1. Introduction

Winemaking is a process involving the transformation of a raw plant material into wine, where it is an intriguing and complicated process. It begins with the harvest or raw plant material arrival to the cellar, followed by the most effective fermentation processes, subsequently some wines undergo a long maturing process, to improve the flavor and fragrance ^[1].

This review mainly discusses the process of wine making in the fermentation and aging stage, in contrast other processes which are involved in winemaking, such as wine filtration, packaging, and bottling are not discussed in this paper.

2. Chemical changes

The sugar in the grapes is consumed by the yeast, where the sugar is broken down into ethanol and carbon dioxide, simultaneously produces heat. Wines are classified into different types, based on the yeast strains, and grape varieties, which are used in the winemaking process. These variations are the result of intricate interactions between the biological growth of the grape, the grape growing environment, and the yeast strain ^[2].

Chemical interactions also take place between the molecules which are present in the must, those gradually extracted from the grape solids during fermentation, those obtained from metabolism, and those released by the wood, in addition the biochemical reactions catalyzed by enzymes produced by yeast or bacteria. In the large number winemaking process, the temperature and dissolved oxygen factors which are associated with the technological operations of the winery, may have a dramatic effect on the wine, additionally the type and intensity of reactions which that took place, may determine the quality of the

finished wine.

2.1. Yeast

Yeasts that are frequently discovered on grapes and in wine are commonly from the following genera; *Saccharomyces*, *Kloeckera*, *Hanseniaspora*, *Candida*, *Hansenula*, *Pichia*, and *Brettanomyces*. Many non-*Saccharomyces* yeasts, including *Kloeckera*, *Hansenula*, *Candida*, and others, are thought to thrive and take part in the initial stages of natural or spontaneous fermentation [3]. In order to produce Fino wines (biological aging), Amontillado wines (biological aging followed by oxidative age) or Oloroso wines, the fermented wine musts go through two selection processes (oxidative aging only) [4].

The ethanol concentration rises with the fermentation procedure, additionally high level of ethanol prevents native non-*Saccharomyces* yeasts from proliferating and becoming active, promoting the development and dominance of *Saccharomyces cerevisiae* yeast, followed by the fermentation process. Natural fermentation proponents assert of wine with a mixed culture fermentation has more nuanced aromas [3].

2.2. Alcohol fermentation

Alcohol fermentation is a biological process that turns glucose into ethyl alcohol and carbon dioxide using yeast, some types of bacteria, or a few other microorganisms. Aqueous monosaccharide solutions are utilized as the culture media and yeast is often used as the bio-culture agent in this fermentation process to produce wine. Yeast typically performs the aerobic fermentation step in the production of alcohol; however, it is also capable of performing anaerobic fermentation of the basic ingredients. Alcohol fermentation takes place in the yeast cytoplasm in the absence of oxygen. Glycolysis, is a process which yeasts break down carbohydrates to produce pyruvate molecules, a precursor for alcohol fermentation. Two molecules of pyruvic acid are created during the glycolysis of a glucose molecule, subsequently the molecules of pyruvic acid are broken down into ethanol and carbon dioxide (CO₂) as shown in **Figure 1** [3].

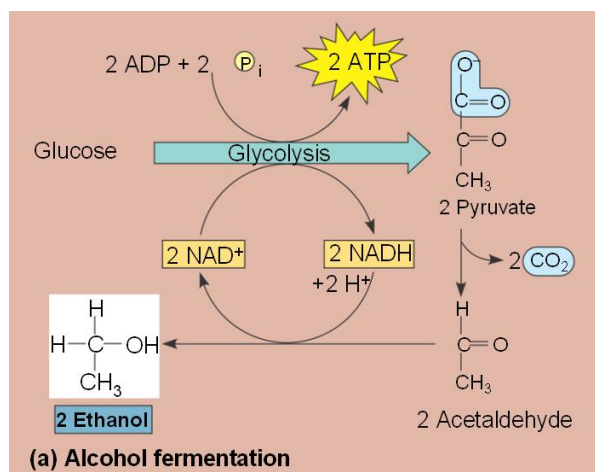


Figure 1. Alcohol fermentation releases CO₂ as a byproduct in addition to producing alcohol

2.3. Malolactic fermentation

Malolactic fermentation (MLF), also known as secondary fermentation or malolactic de-acidification, is a process in which the malic acid is transformed into mild-tasting lactic acid. Because no alcohol is created during the malolactic fermentation process, it should be noted that this process is essential for the decarboxylation of L-malic acid to produce L-lactic acid and CO₂ [5]. A rise in pH and a decrease in perceived acidity are the main outcomes of the malolactic fermentation process. A Typical a wine's acidity

can be decreased by 0.1% to 0.3%. The malolactic fermentation process can occur naturally, or winemakers will initiate it intentionally by inoculating the specific bacteria into the wine. The bacteria which are commonly used to conduct the malolactic fermentation are from the genera *Lactobacillus* and *Pediococcus*, however, *Oenococcus oeni* is the preferred bacteria species for the malolactic fermentation process of all type's wines [3].

2.4. Sulfur dioxide

Sulfur dioxide is the most commonly used additive in winemaking, due to its numerous functions, including its ability to fight undesirable microbes, prevent oxidation, stop enzymatic and non-enzymatic browning reactions, and improve wine quality [3]. Therefore, the biggest efforts in winemaking are to reduce the amount of chemicals which can permanently bind the sulfur dioxide, increase the molecular sulfur dioxide by pH management or investigating new naturally occurring preservation substances [6].

Only sulfur dioxide in free form has the antioxidant and antimicrobial properties. The sulfur dioxide in free form has three states; molecular sulfur dioxide (SO_2), bisulfite (HSO_3^-), and sulfite (SO_3^{2-}). They are in dynamic equilibrium as shown in **Figure 2**. The quantities of these different forms of free sulfur dioxide depend on the pH, and each form has different properties. The antibacterial properties of sulfur dioxide, mostly attributed to the molecular form, which is typically only present in trace amounts. In contrast to the sulfite form, which is present in very tiny amounts and has little enological significance, the bisulfite form plays a significant role in the antioxidant capabilities of sulfur dioxide [7].

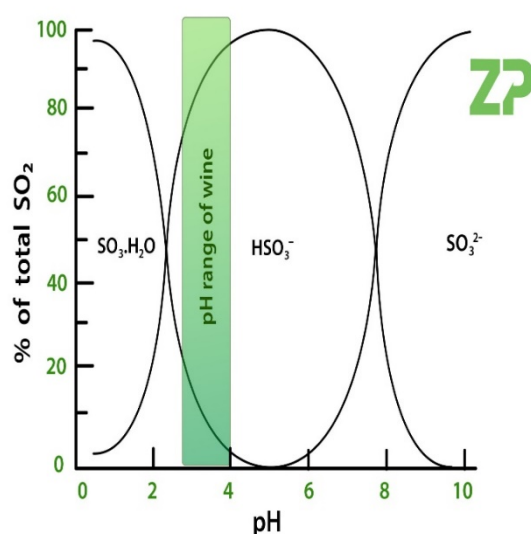


Figure 2. Three states; molecular sulfur dioxide (SO_2), bisulfite (HSO_3^-), and sulfite (SO_3^{2-}) of sulfur dioxide in wine

2.5. Maturation of wine

Maturation is a period during which the wine evolves at the winery, either in tanks or oak barrels, towards a degree of stability before undergoing fining and tartrate stabilization. Maturation is defined as the bulk storage period, whereas aging describes the changes in wine composition after bottling, and often these two terms are used interchangeably. Maturation whether in tanks or barrels, is essentially for oxidative reactions, meanwhile aging is more reductive in the bottle. The maturation of wine is a process of refining the wine by removing most of the residual CO_2 , removing sediments, and other insoluble materials, and eliminating any raw or harsh odors and tastes [3].

3. Quality control points, sensory, and nutritional attributes

For a fermentation process to be completed, ten days to a month or more may be needed. Due to the must's overall sugar concentration, the alcohol content of a wine may differ depending on the region. In a region with cold temperatures, an alcohol level of 10% in wine is considered usual, compared to a maximum of 15% of alcohol content in a warmer region. When the fermentation process is interrupted before all the sugar has been metabolized into alcohol, sweet wine would be produced. Typically, the winemaker makes this decision with awareness and intention ^[8].

3.1. Fermentation temperature

Most of the red wines should have their fermentation temperatures maintained between 70 to 85°F to obtain the greatest color and tannin extraction. It is crucial to remember that the finished product could have an unfavorable cooked flavor when temperatures start to get close to 90°F. In addition, wine may be controlled at its ideal temperature within a small 15°F range.

Next, high-quality white wine can be made at a fermentation temperature that is comparably lower than red wine, where white wines typically undergo a gradual fermentation process over a few months at 45 to 60°F.

The exquisite white wine's delicate fruit flavors and ephemeral scents are perfectly preserved by the cooler temperature. Taking the Sauvignon Blanc fermentation temperature as an example, Gene Spaziani claims that the best temperature range for fermentation is between 42 and 50°F (one of the lower ranges for white wines) ^[9].

3.2. Fermentation sensory attributes

The proportion of aromatic molecules varies depending on the used yeast strain, thereby deciding how the wine smells and tastes ^[10]. In addition, MLF process also has great influence on the wine taste. Malic acid is believed to taste like the green apple peel, and has a sour flavor, meanwhile lactic acid has a buttery or milky flavor. This issue can be resolved by the MLF process, which can transform the malic acid into lactic acid, to produce wine with smooth and distinctive unique taste ^[11].

In addition, milk and other dairy products contain lactic acid. In fact, milk acid is a common nickname for lactic acid ^[12]. If a Chardonnay is described as tasting buttery, it has probably experienced malolactic fermentation, which imparts a buttery or creamy flavor to wine. Besides, a mouthfeel impact might be perceived ^[13].

3.3. Sulfur-like off-odors

Sulfur contributes to several wines off-flavors, including the presence of hydrogen sulfide (H₂S), reductive aromas (developed by mercaptans/thiols or disulfides), and a high concentration of free sulfur dioxide. The word sulfur is often used incorrectly, to describe all of these aromas and flavors. However, each defect has a particular aroma/flavor that is somewhat unique; (1) H₂S has the aroma of rotten eggs or hard-boiled eggs; (2) Mercaptans or thiol-based compounds and disulfides have various aromas/flavors, and common descriptors including canned or cooked vegetables, canned asparagus, garlic, onion, cooked cabbage, garbage, putrefaction, burnt rubber, canned corn, and molasses; (3) High free SO₂ smells like recently burned matches, and often causes a burning or irritation in the nose.

Chemically, all of these compounds are very different despite the fact they all contain the element of sulfur. Further, remediating these defects in wine requires winemakers to properly identify the problem, and use appropriate techniques to treat the problem ^[14].

3.4. *Brettanomyces* or Dekkera off-flavor

Wine is frequently contaminated with the yeast *Brettanomyces*, which can be found in every wine-producing location of all the six continents. The biggest problem of this yeast is, it can create biofilms or coatings on tanks, hoses, and on other winery surfaces which are extremely hard to remove, and is a place where an organism can thrive and withstand the effects of disinfectants ^[15]. In addition, barrels are hard to clean and sterilize because of their porous nature, and its ability to produce wood sugar. They also frequently support colonies of *Brettanomyces*. The fact that *Brettanomyces* can persist in the condition known as a viable non-culturable (VNC) state is another factor contributing to this issue. The majority of sanitation procedures are evaluated, by examining the treated surface to determine if there are any living organisms present on the surface. Under these circumstances, organisms in a VNC state do not develop and give the impression that the sanitation program was ineffective, but they are really still alive and capable of growing in the future ^[16].

3.5. Maturation of wine

Young wines of excellent quality are distinguished by being full of floral to fruity tastes, distinct varietal scents (if distinctive of the grape cultivars used), possessing a balanced mouthfeel, and producing a flavorful enjoyment. A wine that benefits from a long aging, in contrast, has little scent when young (because it is too bonded to nonvolatile wine ingredients), and is frequently quite astringent ^[17].

The grape-derived smells diminish as the wine ages, while more nuanced and palatable aromas emerge, further the wine's flavor also varies. Astringent and harsh tastes are replaced by smoother and rounder tastes. Additionally, changes in color can also occur during the maturation process. Wineries frequently employ the process of maturing wine in oak barrels to improve the stability and richness of their products ^[3]. Further, different maturation temperature can also have an impact on wine color, volatiles, and sensory profile ^[18].

3.6. Antioxidants produced

Phenolic compounds and glutathione are the two primary categories of antioxidants found in grapes and wines. Phenolics are a broad range of substances that may be found in both white and red grapes. The amount of phenols in wine varies depending on the grape cultivar, how the grapes are handled and processed, how the grape juice are handled, and how alcohol the is fermented. An essential tripeptide with sulfur and glutathione, can also be used as an antioxidant in wine, and the variables which may influence its production are juice processing method, oxidation process, and yeast strain ^[19]. Typically, red wines often have stronger antioxidant activity than white or sherry wines ^[20].

4. Conclusion

In summary, winemaking is a complicated process. In order to change a wine's component formula, and make important decisions should be made depending on the quantities of acid, sugar, tannin, and other wine components, where a winemaker has to integrate scientific principles with practical expertise. Winemaking is often described as the blend between science and art, thereby a winemaker should be well grounded in chemistry and microbiology, as well have the creativity and artistic nature to create genuinely fine wine, consistently.

Disclosure statement

The author declares no conflict of interest.

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For references in reference list, all authors must be stated. Authors referenced are listed with their surname followed by their initials. All references should be numbered (e.g. 1. 2. 3. etc.) and sequenced according to the order it appears as an in-text citation. References should follow the following pattern: Author(s) followed by year of publication, title of publication, full journal name in italics, volume number, issue number in parenthesis, page range and lastly the DOI (if applicable). If the referred article has more than three authors, list only the first three authors and abbreviate the remaining authors to italicized 'et al.' (meaning: "and others").

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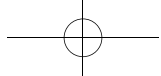
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Note: When referencing an entry from a dictionary or an encyclopedia with no author there is no requirement to include the source in the reference list. In these cases, only cite the title and year of the source in-text. For an authored dictionary/encyclopedia, treat the source as an authored book.

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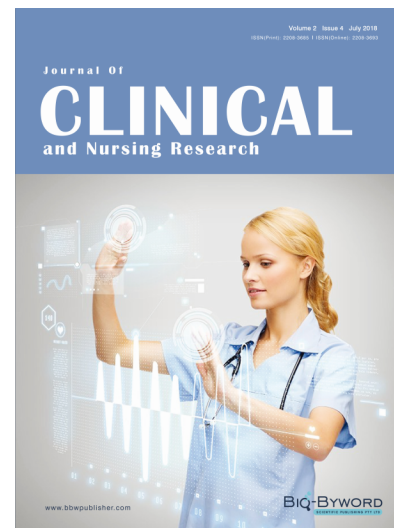
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