Research article

Spatial and temporal characteristics, spatial clustering and governance strategies for regional development of social enterprises in China

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ABSTRACT

Social enterprises are a powerful starting point for achieving Common Prosperity. Expanding the scale of social enterprises in China is conducive to promoting sustainable social development. This study uses exploratory spatial data analysis methods to systematically analyze the spatio-temporal pattern, clustering characteristics and impact mechanism of the development of social enterprises in provincial administrative regions in China. The research has found that provincial social enterprises in China showed a random distribution pattern from 2015 to 2018, and showed significant negative spatial correlation from 2019 to 2022, forming a local spatial pattern of "low ones consistently low, high ones consistently high", with obvious path and spatial dependencies as well as regional isolation effects; From 2015 to 2022, the core density of provincial social enterprises showed a significant "unipolar" phenomenon, exhibiting significant spatial imbalance. Based on the TOE framework, each province and city can be divided into three clusters: demonstration provinces and cities for the development of social enterprises, starting provinces and cities for social enterprises, and lagging provinces and cities for the development of social enterprises. The first classification presents characteristics of dispersion and cross domain, while the other two categories have strong regional continuity. The core driving factors that affect the spatial differentiation of social enterprise development have regional differences, among which the decisive factor is government policy support, and the interaction factor has an enhanced effect on provincial spatial differentiation compared to a single factor. Sorting out the development characteristics of social enterprises is conducive to promoting the large-scale development of social enterprises and promoting cooperation and dialogue with other countries.

1. Introduction

Chinese-style modernization represents a comprehensive approach to cultivating collective prosperity. The report of the 20th National Congress of the Communist Party of China clearly states the in-depth promotion of Chinese-style modernization and prioritizes the aspirations of the people for a better life as the starting point of modernization construction. The cooperation and shared governance of multiple subjects under the leadership of the government is the key point and breakthrough to creating a social governance pattern of common construction and sharing and to promote the modernization of national governance. As an emerging

form of organization, social enterprise applies business operation to the realization of social goals and social innovation based on a certain social mission, realizes the integration of multi-level needs and the positive response to social problems across sectors, industries and fields, and is rapidly developing with the support of the government and all walks of life. Unlike traditional enterprises, social enterprises can promote regional development and achieve the goal of "common prosperity all" by improving the transmission system of resources for the third distribution [1]. Social entrepreneurs use scientific and technological innovation to solve social problems [2,3], which is beneficial for achieving various social welfare goals of Chinese-style modernization. The current local model of social enterprise development in China is taking shape, but it is characterized by uneven distribution and obvious regional differences. Judging from the data on social enterprise certification, it is mainly concentrated in Beijing, Sichuan and Guangzhou. The spatial and temporal differences of social enterprises are the result of the interplay between organizations and institutional environments, and the existing research mainly focuses on individual characteristics and institutional environment perspectives [4,5].

The current evolution of social enterprises in China is showing initial signs of local models, presenting distinctive attributes such as uneven distribution and significant regional differences. The spatiotemporal patterns of social enterprise development require further in-depth exploration. From the perspective of certification data, social enterprises in China are mainly concentrated in Beijing, Sichuan, Guangzhou, and other areas, showing significant regional clustering characteristics. From the overall development pattern, the study of social enterprises in China has undergone a process of understanding and assimilating the concept of social enterprises from Europe and the United States to the research of local social enterprise practices, presenting different development characteristics from other countries such as the European Union and South Korea [6–8]. It can be summarized from the perspective of institutional analysis as a "semi-strategic focus" Southeast Asian country model [9]. The high institutional isomorphism pressure in China [10], the institutional environment that does not support social entrepreneurship [11], civil society [12], and other factors may be external factors causing distribution differences. The spatiotemporal differences of social enterprises are the result of the game between organizations and the institutional environment, and existing research mainly focuses on individual characteristics and institutional environment perspectives. The temporal and spatial characteristics of the development of social enterprises in China are only limited to sorting out the historical evolution of social enterprises in terms of the conception and the whole process of social enterprises, multi-level influencing factors, and analyzing the practical experience and coping strategies of the development of social enterprises through case studies and questionnaire surveys, etc., which lacks further research on the status quo of the imbalance in the regional development of social enterprises. Therefore, systematically and fully examining the influencing factors and differential characteristics of the provincial development of social enterprises, and analyzing the vein of China's social enterprise development from a quantitative perspective may generate new insights, which will be more conducive to clarifying the vein of China's social enterprise development [13,14].

Therefore, this study intends to use spatial autocorrelation analysis, kernel density estimation, and geographic detectors to investigate the spatial-temporal characteristics and dynamic development trends of social enterprises in Chinese provinces. Based on the TOE analytical framework to explore the influencing elements of the high-quality development of social enterprises in China, systematic clustering of social enterprises in various provinces and cities, exploring the characteristics of indicators affecting the development of social enterprises, and proposing a hierarchical governance strategy for social enterprises to provide suggestions for promoting the high-quality development of social enterprises. The potential research contributions of this paper may lie in the following aspects: First, it provides a detailed explanation of the spatial-temporal characteristics of social enterprise development in China from a quantitative perspective between 2015 and 2022. It conducts a clustering analysis of social enterprise development patterns, enriching our understanding of these patterns. Second, it introduces the TOE framework to explain the current status of social enterprise development and uses geographic detectors to quantitatively analyze the factors influencing the spatial distribution of social enterprises in provinces, based on which development governance strategies are proposed.

The article has the following structure. After the introduction, section 2 indicates the main introduction of the research methodology used in this study, arguing the fit between the research question and the research study methodology. In addition to this, the data and data sources used in this study are presented through a literature dialogue. Section 3 analyzes the spatial and temporal characteristics, spatial and temporal differences, urban clustering, and developmental impact mechanisms of the regional development of social enterprises in China. Section 4 proposes differentiated development strategies for provinces and cities based on clustering results and city characteristics. Section 5 summarizes the findings of this paper and discusses the significance of the study.

2. Literature review and research framework

2.1. Research review

Research on existing social enterprises has grown rapidly, but overall it is still in the early stages. Much of the literature focuses on descriptive assessments of social enterprise development, lacking in-depth macro-level quantitative research and systematic exploration of social enterprise development. Previous research has established that external environmental factors such as human resources [15,16], cross-sector collaboration networks [17,18], group diversification [19], resource interdependence among heterogeneous population organizations [20,21], inter-organizational competitive pressure [22], and homogeneity survival pressure [23], and elements such as pro-social motives [24], ESG concepts [25], contractual cooperation [26], and other characteristics of differences in their own modes of operation, affect the regional differences of social enterprises in China. The successful management experiences [27,28], implementation of management strategies and their dissemination [29,30] also have an impact on the scale expansion of social enterprises.

Existing research on the regionalized development of social enterprises in China mainly focuses on the compilation of the historical

lineage of social enterprises, and there are relatively few studies on the spatial and temporal characteristics of social enterprise development, most of which briefly evaluate the current status of social enterprise development. The lack of quantitative research has already impeded the rapid development of social enterprises [31]. The mainstream of domestic research roughly follows the evolution of "corporate social responsibility" to "social enterprise" and "social entrepreneur" proposed by the West, ignoring the historical experience of China's long-established social enterprises aiming at "serving the country through industry" [32]. Since its introduction, the social benefits generated by social enterprises have been widely recognized by society [11], and the institutional reforms of 1956 and 1978 have further promoted the transformation of the management mode from administrative to market-oriented and entrepreneurial [33], but in general, the development of social enterprises has shown a tendency towards barbaric growth. Restricted by the social environment, economic level, cultural background and their own ability [34], social enterprises are mostly small and micro-organizations, the operation mode of social enterprises is immature, the self-breeding ability is weak, the market share, regional coverage and social influence are still very limited [35], and the system construction has been lagging behind the development of practice, the construction of the institutional framework has always lagged behind practical development [36], and the development of social enterprises has been in a relatively disordered and unbalanced state of development in general. To solve this problem, existing scholars have tried to sort out the development history of social enterprises from the perspective of the quantity of literature [37], and point out the gap between social enterprises and the same type of organizations based on the cross-section data of industry certification [30], etc., but with little effect. Even though social enterprise certification in China has transitioned from civil operation to integrated certification, the existing normative content of social enterprises is relatively shallow and the scope of application is too limited [38]. The dependence of social enterprise development on geographical location has not been significantly weakened [2], and the overall development of social enterprises has increasingly shown an imbalanced growth pattern.

Current research on the development of social enterprises in China is mainly limited in the following aspects: First, existing studies only summarize the development experience of social enterprises in a scattered manner from case studies or a small number of samples, and they cannot quantitatively describe the overall development characteristics of social enterprises in China. There is a relative lack of macro-quantitative research on the current situation of social enterprises in existing research, and there is also a shortage of in-depth research on the development laws of social enterprises. Second, the research data analysing the current situation of social enterprises in China is limited, which hinders the progress of existing research. For example, the analysis of social enterprise certification data in the International Comparative Social Enterprise Models (ICSEM) project only includes data from 2015 to 2019, and cannot accurately describe the current development situation of social enterprises in China.

This study provides a phased description of the development of social enterprises in China, attempting to explore the developmental characteristics and common elements of early-stage social enterprises, as well as preliminary group portraits at the regional level. The innovation of this study is reflected in three aspects: firstly, addressing the issue of temporal and spatial differences in the development of social enterprises, this study creatively introduces the TOE analysis framework into the field of regional development of social enterprises, providing a richer and more comprehensive perspective for the field of social enterprise research. Secondly, based on the official certification data from 2015 to 2022, this study systematically expounds the temporal and spatial differences, current development status, and driving factors of the development of social enterprises in China from a quantitative perspective, attempting to fill the current research gaps and provide new ideas and insights for the development of social enterprises. Finally, starting from a practical perspective, this study conducts in-depth research on the distribution differences of social enterprises, discovering research patterns that have not been previously found, which can provide valuable guidance for promoting the practice of social enterprises.
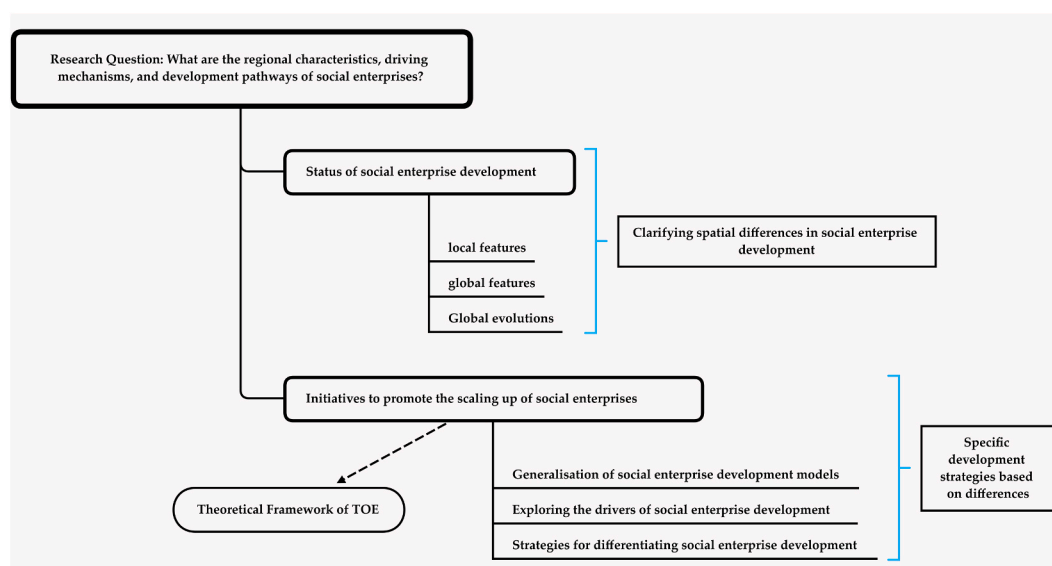

Fig. 1. Research logic breakdown chart.

2.2. Research framework

This study attempts to clarify the spatial and temporal evolutionary characteristics of certified social enterprises in China on the basis of existing research. The logical decomposition diagram of this study is shown in Fig. 1. We have subdivided the research problem into two sub-problems: elucidating the spatial differences in the development of social enterprises and formulating specific development strategies based on the differences. In this paper, we first focus on clarifying the local, global and evolutionary characteristics of social enterprise development from 2015 to 2022, based on which we introduce the TOE theoretical framework in the field of innovation, identify the influencing factors based on the dialogue of the existing literature, clarify the status of the development of social enterprises in China through the clustering of the provincial areas, and give differentiated governance strategies based on the characteristics of different regions. In order to meet the research purpose, this paper selects the exploratory analysis method, i.e., to reveal the spatial characteristics and laws embedded in the data based on the relationship between the data, which is in line with the starting point of this paper.

It is important to note at the outset that our research framework is built on a foundation that draws on historical institutionalism and macro-social enterprise analytical frameworks. Grounded in historical institutionalism, which argues that new institutions are shaped by the support and constraints of previous and current institutions, Janelle A. Kerlin has developed a macro-institutional social enterprise framework using national institutional variables (civil society, governance, welfare spending, culture, and the economy) using the theory of historical institutionalism [39], which has been widely used in analysing social enterprise models in different countries [39–44]. This research framework plays an important role in the selection of research variables and in elucidating the characteristics of social enterprise development in China.

Secondly, based on comprehensive, sustainable attention and operability, we chose to cite the TOE framework to analyze the factors that may affect the development of social enterprises. The TOE framework is a tool for assessing and managing the sustainability of organizations that integrates important factors that affect organizational sustainability in the aspects of technology, organization, and environment. The reason for using this framework in this study is: First, the framework is widely used in research on technological innovation and organisational change and is suitable for analysing the types of organizations, like social enterprises, that pursue social goals and need to use innovative technology and effective organization. Second, the TOE framework regards technology, organisation, and environment as interacting elements, believing that they jointly shape the behaviour and performance of the organisation, which helps us to deeply understand the development mechanisms of social enterprises.

Finally, from the point of view of the distribution of the number of certified social enterprises, the development of social enterprises in China is still in its infancy. This study focuses on the 31 provinces and cities in mainland China, among which 28 provinces and cities have been certified as social enterprises. The cumulative distribution map of certified social enterprises in all provinces and cities of mainland China in 2022 is shown in Fig. 2.

Fig. 2. Distribution of cumulative certified social enterprises in provinces and regions of mainland China, 2022.

3. Materials and methods

The applicable conditions for spatial autocorrelation analysis are the need to have data from neighboring regions and the spatial position of the data has an impact on the results. Spatial autocorrelation analysis can be used for exploratory analysis and modeling of spatial data, providing support and assistance in studying the spatial characteristics and patterns of geographical phenomena.

3.1. Spatial autocorrelation analysis

Global spatial autocorrelation analysis is based on spatial location similarity to measure the relationship between variables, which can be used to measure the degree of spatial correlation and spatial difference between regions as a whole, and Global Moran's I and Local Moran's I are commonly used statistical indicators. The Global Moran's I statistic is a commonly used global spatial autocorrelation measure, and its value range is $[-1,1]$, and the formula is expressed as shown in Equation (1):

$$Moran's\ I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}W_{ij}(Y_i - \overline{Y})(Y_j - \overline{Y})}{S^2\sum_{i=1}^{n}\sum_{j=1}^{n}W_{ij}} \tag{1}$$

where n is the total number of districts, $S^2 = \frac{1}{n}\sum(Y_i - \overline{Y})$, and W_{ij} denotes the normalized spatial linkage matrix. We adopt a first-order ROOK weight matrix based on common boundaries, where W_{ij} is equal to 1 if region i and j are adjacent, and 0 otherwise. At a given confidence level, a significantly positive Moran's I indicates a spatial clustering of regions with a better number of social enterprises. On the other hand, if Moran's I is significantly negative, it suggests significant differences in the number of social enterprise development among regions. Moran's I is close to the expected value $\frac{-1}{(n-1)}$ only when the observed values are independent and follow a spatial random distribution. The positive or negative value of Moran's I reflects the similarity or dissimilarity of the variable in terms of spatial patterns. However, it only reflects the average spatial differences in social enterprise development. To comprehensively assess the local spatial disparities in social enterprise development, local spatial autocorrelation analysis is needed.

Local spatial autocorrelation analysis examines the significance level of spatial association using Moran scatter plots and Local Moran's I statistics to analyze the degree of spatial differences between each region and its surrounding areas. Local Moran's I statistics measures the spatial differences and significance of social enterprise counts between region I and its neighboring areas, which is a decomposition of the global spatial autocorrelation statistic, Global Moran's I. The formula for calculating the Local Moran's I statistic for the i-th region is as shown in Equation (2).

$$I_i = Z_i\sum_{j=1}^{n}W_{ij}Z_j \tag{2}$$

where W_{ij} is the spatial weight and Z_i, Z_j normalized observations. Combined with the Moran scatter plot, if I_i is significantly greater than 0 and Z_i is greater than 0, region i is located in the HH quadrant; if I_i is significantly less than 0 and Z_i is less than 0, region i is located in the LH quadrant, and the significance of I_i can be used with the Bonferroni criterion.

3.2. Kernel density estimation

Non-parametric Kernel Density Estimator is a commonly used method to study the equilibrium distribution of the regional economy, which has the advantages of robustness and weak model dependence [45]. In this paper, we will use the Kernel Density Estimator to examine the distribution dynamics, distribution location, distribution trend, evolution trend, and characteristics such as individual differences, etc., of the development of social enterprises in China from 2015 to 2022.

The formula for measuring the concentration and dispersion of the number of social enterprises using the kernel density function is as shown in Equation (3):

$$D(X_i, Y_i) = \frac{1}{ur}\sum_{i=1}^{u}k\left(\frac{Y_i - \overline{y}}{r}\right) \tag{3}$$

In this equation, where $D(X_i, Y_i)$ is denoted as the kernel density value of social enterprises at the spatial location (X_i, Y_i), and r is the search radius; u is the number of point elements whose distance from the location (X_i, Y_i) is less than the search radius r, the k function denotes the spatial weight, Y_i denotes the number of social enterprises in the region i, and $\overline{y}$ denotes the mean value of the number of social enterprises in China.

In order to enhance the robustness, this paper draws on the Gauss kernel function chosen by related studies for distributional dynamics [46], as shown in Equation (4):

$$K(X) = \frac{1}{\sqrt{2\pi}}\exp\left(-\frac{x^2}{2}\right) \tag{4}$$

The kernel density estimation method uses a smoothed peak function to fit sample data, and then uses a continuous density curve to visually describe the distribution shape of a random variable. The kernel density curve provides information about the distribution position, distribution characteristics, distribution spread, and polarization trend of a variable. For the purpose of this paper, the distribution position reflects the level of social enterprise development. The distribution shape reflects the differences and polarization

degree of regional development of social enterprises, where the height and width of the peaks reflect the magnitude of the differences, and the number of peaks reflects the degree of polarization. The distribution spread is used to characterize the spatial differences between the city with the highest level of social enterprise development and other cities. If the tail is longer, the differences are larger.

3.3. Cluster analysis

Cluster analysis can be used to aggregate all units into a classification system with high homogeneity of individuals within a class and high heterogeneity of individuals between classes based on the similarity between them according to the indicators of multiple variables. As an exploratory analytical method, the results of cluster analysis facilitate an in-depth analysis of the differences within and between categories of social enterprise development and the factors that influence them, as well as an exploration of the impact of the differences in economic development caused by differences in resource endowment conditions on social enterprise development [47].

Clustering methods can be roughly divided into spectral clustering methods such as the sum of squared deviations method, the density estimation method, and non-spectral clustering methods such as the mean clustering method and constrained clustering method, etc. Referring to the existing studies [14], the Ward system clustering method is used to comprehensively categorize the provinces and cities in China. n samples are divided into k classes, and the sum of squares of the deviations of each reduced class will increase, so that the two classes with the smallest increase in S will be selected and merged, and the cycle is iterated to the point where all the entities are clustered together into a single cluster.

3.4. Geographic detector

The Geographic Detector is a set of statistical methods based on spatial differentiation theory to detect spatial variability and reveal the driving forces behind it. The correlation between the factor variables and the outcome variables is obtained by normalizing the different types of variables in the same spatial scale through different discrete classification methods for each type of factor. The core assumption of the Geographic Detector model, which consists of factor detection, ecological detection, and interaction detection, is that the spatial distributions of independent variables and dependent variables should be similar if an independent variable has a significant effect on a dependent variable [48]. The Geographic Detector has two main advantages: it can detect both numerical and qualitative data, and it can also perform single-factor detection and interaction detection between driving factors and outcome variables. By separately calculating and comparing the q-values of each single factor and the q-values after the two factors are superimposed, the Geographic Detector can determine whether there is an interaction between the two factors, as well as the strength, direction, linearity or non-linearity of the interaction [49].

The Factor Detector is used to detect whether a geographic factor is responsible for differences in the spatial distribution of values of an indicator by comparing the total variance of the indicator in different categories of subdistricts with the total variance of the indicator over the entire study are. The calculation formula is as follows in Equation (5):

$$P_{D,H} = 1 - \frac{1}{n\sigma^2}\sum_{i=1}^{m} n_{D,i}\sigma^2_{H_{D,i}} \tag{5}$$

In the equation, $P_{D,H}$ represents the explanatory power of the detection factor of the detection area D on the regional development of social enterprises. m is the driving factor for changes in the number of social enterprises. n and σ^2 respectively represent the overall sample size and variance of the study area. $n_{D,i}$ represents the number of driving factors D in region i. The value of $P_{D,H}$ ranges from 0 to 1, with a higher value indicating a stronger explanatory power of the factor on the development of social enterprises in the region. Especially when the sample size is less than 30, the relationship between Y and X established using a geographical detector is more reliable than classical regression.

Social enterprise development is deeply influenced by economic, social and natural factors. Traditional methods for analyzing such problems require many assumptions, while the Geographic Detector is less constrained by assumptions. Therefore, it can be used to study the formation mechanism of the spatial distribution of geographical phenomena. They have been widely applied in research on urbanization and technology parks [50].

3.5. Indicator selection and data sources

To accurately identify the reasons for regional differences in the number of social enterprises, this article proposes an integrated analysis framework for the regional development of social enterprises, taking into account the generality of the TOE framework and the criteria for factor division, combined with the characteristics of social enterprise development in China. Specifically, by examining internal and external factors and the characteristics of the technology itself, the TOE theoretical framework can be applied to attribute analysis of enterprise or organizational decision-making in different situations, and the influencing factors can be classified into three categories: technological level, organizational level, and environmental level. Several scholars have already applied this framework to research on the regional imbalanced development of organizations [51].

Based on the deductive induction of existing research, this article selects the following indicators for subsequent cluster analysis [52–58], as shown in Table 1.

For the technological conditions dimension, four secondary indicators were selected, namely, regional innovation capacity,

knowledge flow, knowledge creation and informationization level. The creation and flow of knowledge play a crucial role in the initial opportunity identification, problem-solving, and value creation of social enterprises [3,59]. The success of social enterprises in Beijing, Chengdu, and other areas can be attributed to the level of interaction between knowledge and information in academia, industry, and politics, which determines the flow of knowledge and the ability for social innovation [60,61]. The development of information technology has weakened the weight of traditional social enterprise constraints, and provinces and municipalities with a better foundation in information technology are more likely to use emerging knowledge to start social enterprises. Therefore, the technological aspects of social enterprise development are divided into two dimensions: technology management capacity and technology infrastructure [62], which are further subdivided into four dimensions: the technological capacity of the region to innovate is measured using the regional innovation capacity indicator; the ability to continuously generate new knowledge is measured using the knowledge creation indicator; the ability to continuously utilize all available knowledge globally is measured using the knowledge flow indicator; and the informatization base between provinces is measured using the informatization level indicator. The informatization level indicator measures the informatization base between provinces and regions.

For the organizational conditions dimension, two secondary indicators were selected, namely, the allocation of government attention and the level of financial resources provided by the organization. The transformation process of organizations transitioning to social enterprises can be divided into four stages: element accumulation, organizational expansion, goal conflict, and norm certification [63]. Under certain resource constraints, social enterprises achieve organizational change, innovation, and sustainable social value creation through actions such as shaping internal values, actively obtaining government support, upgrading business models, and coordinating stable dual-value strategies [64]. The government's support and regulation of the organization can provide social enterprises with sufficient resources for the growth of the perfect service, which will have an important impact on the development of social enterprises [65]. Therefore, this paper measures the impact of the government on the development of social enterprises from two dimensions: regulation and support. The government attention allocation indicator is used to measure the government's regulatory efforts on social enterprise organizations, while the level of financial resources provided measures the government's level of support for social enterprises.

For the dimension of environmental conditions, five secondary indicators were selected: social demand, peer competition pressure, marketization level, human resource level and social welfare atmosphere. China's social enterprise development model is characterized by the integration of government-led, civil society-driven, and market-driven supply and demand [66]. Both the personal motivations of social entrepreneurs and the level of human development in the region where the social enterprise is located affect the literacy of knowledge-based resources within the geographic area, which in turn affects the growth of the social enterprise [67,68]. Social enterprises obtain growth resources by building social networks with other organizations [69]. The market environment, as a key external environmental factor in this process, plays different roles in the development of social enterprises, depending on whether it is competition-driven or public welfare-driven [70]. Social enterprises that are clearly social and altruistic are more likely to receive support from governments and non-profit organizations with a good social enterprise atmosphere [71]. Therefore, this article selects indicators to measure from three levels: social, market, and organizational development. The social demand indicator measures the size of social enterprise development demand. The peer competition pressure measures the development foundation of different provinces and cities and the development pressure of social enterprises. The level of marketization measures the market activity of various provinces and cities. The level of human resources measures the human resources needed for social enterprise development. The atmosphere of social welfare measures the necessary atmosphere of public welfare for social enterprise development in various provinces and cities.

Table 1
Definition of cluster indicators.

Dimension	Name of the indicator	Measurement method	Data sources
Technical factors	Regional innovation capacity	Number of patent applications by province and city	China Statistical Yearbook
	Knowledge flow capacity	Knowledge flow dimension scores in China's regional innovation capacity report	Report on China's Regional Innovation Capacity
	Knowledge creation capacity	Knowledge Creation Dimension Score in China's Regional Innovation Capability Report	Report on China's Regional Innovation Capacity
	Informatization level	Informatization development index	China Statistical Yearbook
Organizational factors	Allocation of government attention	Management fees for civil society organizations in the provinces and municipalities	China Civil Affairs Statistical Yearbook
	Level of availability of financial resources	Per capita availability of financial resources in provinces and municipalities	China Statistical Yearbook
Environmental factor	Social demand	Elderly and child population as a percentage of total population	China Statistical Yearbook
	Peer pressure	Number of registered social organizations in a province in the year	China Civil Affairs Statistical Yearbook
	Marketization level	Provincial marketization index	Report on China's Marketization Index by Province
	Human resources level	Number of students graduating from general colleges and universities	China Statistical Yearbook
	Social Welfare Atmosphere	Social welfare income in the provinces and municipalities	China Statistical Yearbook

4. Results

4.1. Evolution of spatio-temporal characteristics of regional development of social enterprises

The Moran's I index for the number of social enterprise certifications in China from 2015 to 2022 is shown in Figs. 3 and 4. As can be seen in the above figure, the Moran's I index range of the number of social enterprise certifications in China is −0.046–0.122, and the Z-value is less than −1.65 in 2019–2022, and the *P*-value is less than 0.1, which passes the 10% significance level test. These data indicate that the number of social enterprise certifications from 2015 to 2018 is geospatially dispersed. However, from 2019 to 2022, there is a significant negative global spatial correlation. Overall, the global Moran's I index has gone through two phases: the first phase is the fluctuating and rising period from 2015 to 2018, with the Moran's I index decreasing from −0.0778 in 2015 to −0.046 in 2016, and then increasing to −0.107 in 2018, at This period is characterized by a decline-rise, but has not yet reached the peak, indicating an increase in the number of social enterprises in China's provinces and cities. During this stage, Guangzhou Shunde, Beijing, Chengdu and many other places have docked the social enterprise certification standard of China CiFair and carried out regional social enterprise certification one after another (as shown in Fig. 5 below), which vigorously promoted the forward development of social enterprises.

The second stage is 2019–2022 as a period of fluctuating development, with Moran's I index peaking at −0.122 in 2019, declining to −0.116 in 2020, rising to −0.119 in 2021, and finally declining to −0.113 in 2022, which is characterized by a certain degree of volatility, indicating that the characteristics of the global spatial pattern of social enterprises in China in 2019–2022 have not yet formed a steady state. In the early stages of this phase, the certification process of social enterprises in various regions of China was delayed due to the impact of the pandemic. In the later stage, social enterprise certification institutions promoted the development of social enterprises through various measures such as transforming the certification process and reconstructing certification standards.

To investigate the local spatial pattern of social enterprise development in China, representative years were selected as 2016, 2018, 2020, and 2022. Overall, the development of social enterprises in China exhibits a spatial pattern of "local clustering and overall dispersion," with only small-scale high-low clustering areas and low-low clustering areas observed. This phenomenon is mainly caused by the concentration of social enterprise certifications in certain provinces, resulting in a significant concentration of social enterprise distribution. As shown in Fig. 6.

As can be seen from Fig. 6, China's social enterprise development according to the degree of local correlation between different provinces and municipalities can be mainly divided into low-low aggregation area, high-low aggregation area and low-high aggregation area of three categories, the general view has been eight years of social enterprise certification history has not yet appeared in high-high aggregation class area.

From the above figure, it can be observed that there is no high-high clustering area for social enterprises in China, which indirectly demonstrates the uneven development status of social enterprises in our country. The regions with a higher number of social enterprise certifications are Chengdu, Beijing, Guangzhou, and Shanghai. Among these four provinces and cities, the first three have introduced specific measures for social enterprise certification, and Shanghai has clearly stated its support for the development of social enterprises in the designated policy documents in Pudong New Area. Another reason is the assistance of social enterprise certification groups. These four provinces and cities, except Shanghai, have organizations specializing in the development and certification of social enterprises, such as the Beijing Social Enterprise Development Promotion Association and the Chengdu Social Enterprise
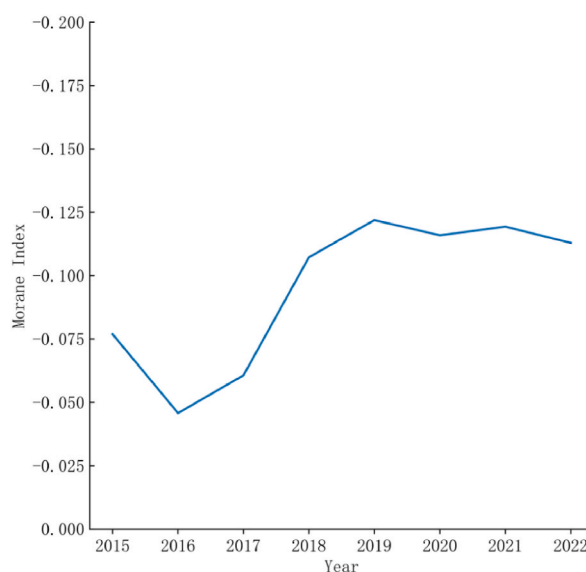

Fig. 3. Global Moran's I index of the number of provincial social enterprises in China from 2015 to 2022.
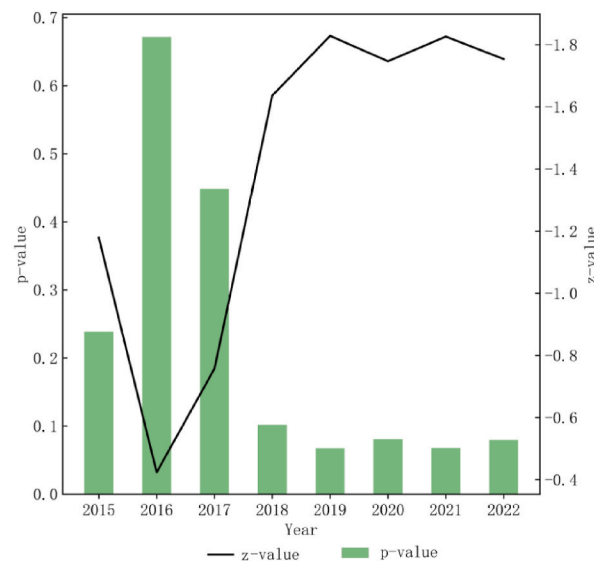
Fig. 4. Global Moran's I index statistics of the number of provincial social enterprises in China from 2015 to 2022.
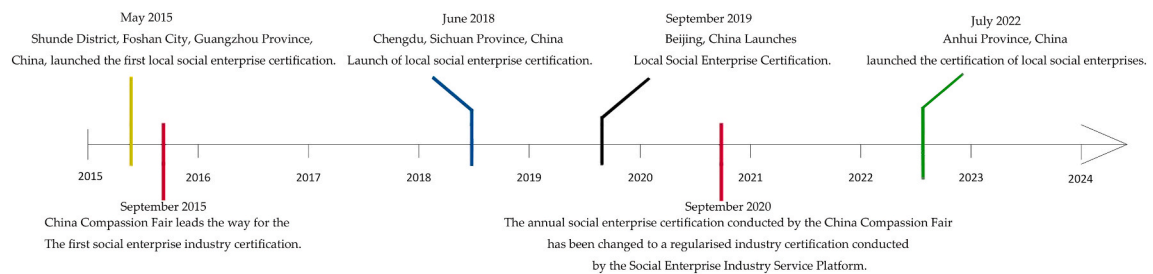

Fig. 5. Overview of the development of social enterprise certification in China.

Comprehensive Service Platform. Government support, empowerment of social organizations, and the demand for social enterprise development have effectively fostered and certified social enterprises.

The second type is the high-low clustering area, which refers to the situation where the number of social enterprise certifications is high in the local province or city, but low in the surrounding provinces or cities. When the social enterprise certification was first conducted at the China Charity Fair in 2015, Gansu and Guangdong were also high-low clustering areas. However, due to the recent start of social enterprise certification and the low number of certifications, they do not have much analytical significance. Beijing has been a high-low clustering area from 2016 to 2020, serving as a good example of this type. The main reason is that Beijing is the capital of China, with high capabilities in scientific research and innovation, economic scale, and personnel quality. The academic community's research on social enterprises, government investigations and guidance, and strong support from the industry have formed a positive feedback loop. This, to some extent, indicates that the diffusion of social enterprises has significant regional segmentation effects.

The third category is the low-low aggregation area, which refers to the low number of social enterprise certifications in the local province or city, as well as the low number of social enterprise certifications in the surrounding provinces or cities. Inner Mongolia is in the low-low aggregation area in 2018, 2020, and 2022, and Liaoning Province is also in the low-low aggregation area in 2020. From a 10% significance perspective, the low-low aggregation areas are mainly distributed in the northeastern part of China. From the overall perspective of social enterprise certification numbers, the low-low aggregation areas are mainly distributed in the northeastern part and the central-western part of China, and will remain in single digits until 2022. The number of social enterprise certifications in these cities has always been at a low level, mainly due to factors such as economic development, consumer structure, resource endowment, and geographical location.

The fourth category is the low-high aggregation zone, which refers to the local city having a low number of social enterprise certifications but its neighboring cities having a high number of social enterprise certifications. Hainan Province in 2015–2019, Jiangxi Province in 2016–2017, and Fujian Province in 2016–2019 are in the low-low aggregation zone, but judging by the combination of the number of certifications, the reason for the introduction of the low-high aggregation zone is that the similarity and relevance of the surrounding spatial units have been improved, not that the number of social enterprise certifications has been significantly increased. The main reason for this is that under the impetus of the government and the international environment, the importance attached by
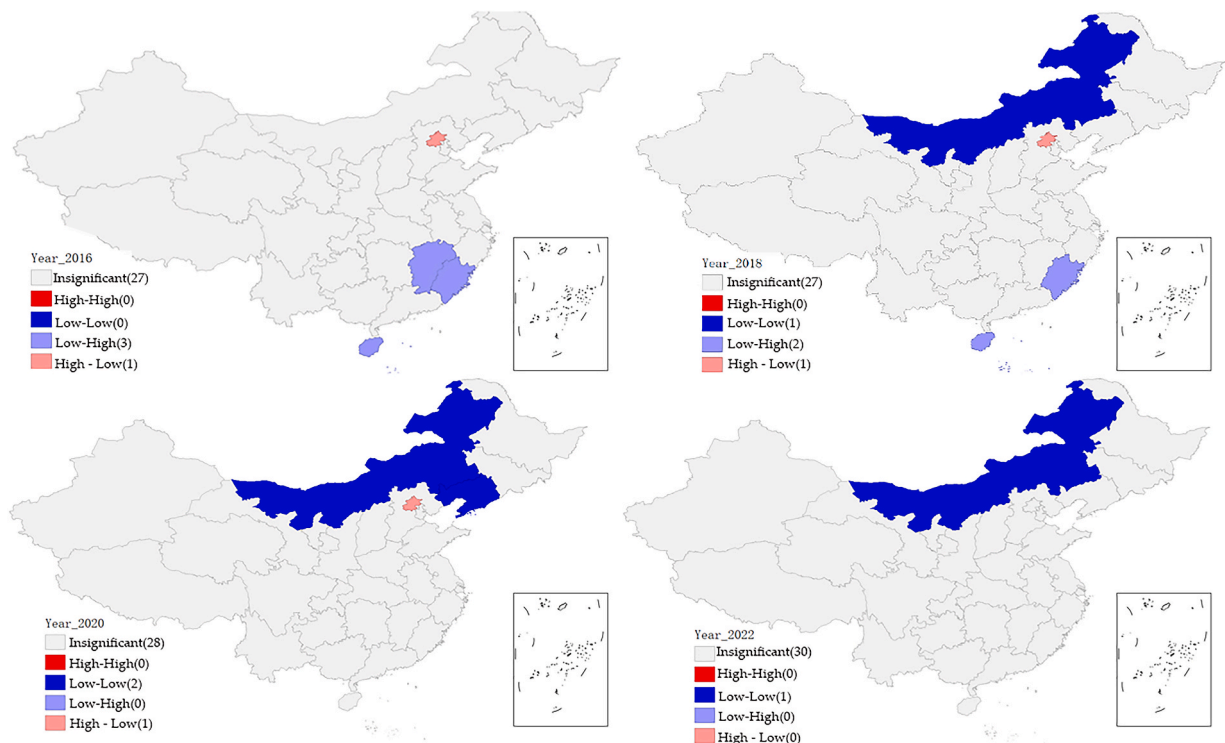
Fig. 6. Local spatial autocorrelation clustering of the number of provincial social enterprises in 2016, 2018, 2020, and 2022.

commercial enterprises to corporate social responsibility and the cultivation of the sustainable operation capability of social organizations have given rise to the internal drive of social organizations in China to transform themselves into social enterprises, which, combined with the promotion of the certification of social enterprises, has resulted in an increase in the visibility of social enterprises, leading to the development of social enterprises in all provinces and cities of China to a certain extent.
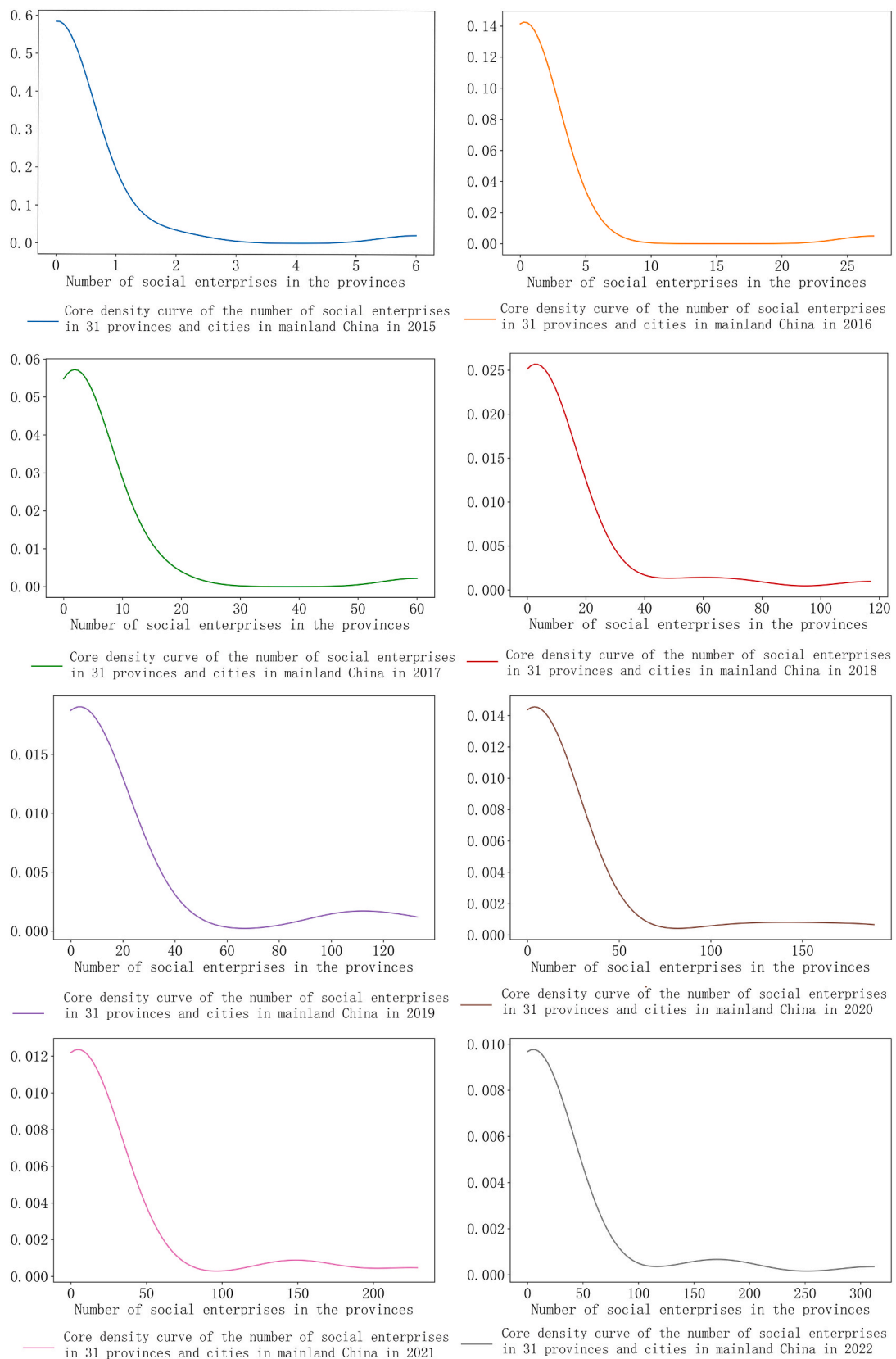
From a quantitative perspective of clustering types, the number of social enterprise aggregation in China is dominated by low-high aggregation in 2016, 2018, 2020, 2022, low-high aggregation, low-low aggregation and high-low aggregation in the transition period, and low-low aggregation is dominated by low-low aggregation category since 2021. Except for some provinces, the development of the rest of the provinces is at a relatively low level. Looking at the eight-year history of social enterprise certification, it is found that the number of social enterprises of different aggregation types shows strong path dependence and spatial dependence, and there is no big breakthrough between the various types, and a localized spatial pattern of "the low remain low, and the high remain high" has been formed. The main reason for this is the limited development factors in the social enterprise environment, which makes it difficult for social enterprise certification to fully leverage neighborhood effects and spatial spillover effects. There is still a significant lack of public awareness and government recognition of social enterprises. Another noteworthy phenomenon is that there are no clear areas of high and low clustering and low and high clustering around Beijing, Sichuan and Guangdong provinces, which is caused by administratively set boundaries rather than real spatial distribution.

4.2. Evolution of spatial and temporal differences in the regional development of social enterprises

To explore the dynamic evolution trend of social enterprise certification at the provincial level in China, this study utilizes the kernel density estimation analysis method to analyze the characteristics of social enterprise distribution in terms of location, form, and extent, as shown in Fig. 7.

In general, from 2015 to 2022, the density of social enterprise certification in China's provinces exhibited a clear "monopolar" pattern. The center of density gradually shifted slightly to the right each year, but there was no significant deviation. The distribution spread of the density curve showed a noticeable widening trend, but the majority of provinces and cities had less than 30 social enterprise certifications. This indicates that the level of social enterprise development in China is continuously improving, but there is a significant spatial disparity in the number of social enterprises across the country.

From the trend of changes in the wave peaks of the kernel density curve, the number of wave peaks is undergoing an evolution from a single peak to a double peak, or even a triple peak, but the height of the secondary peaks is not obvious, which indicates that the phenomenon of polarization of China's social enterprises is improving, and there is a trend of development from polarization at the ends to the center of the cluster, but the phenomenon of regional imbalance in the development of the region has been gradually aggravated.

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2015

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2016

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2017

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2018

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2019

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2020

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2021

Core density curve of the number of social enterprises in 31 provinces and cities in mainland China in 2022

(caption on next page)

Fig. 7. Dynamic evolution trend of the number of provincial social enterprise certifications in China from 2015 to 2022.

The kernel density curve peaked highest in 2015, after which the annual peak gradually declined and the width of the wave peak gradually increased, indicating that the number of social enterprises certified in provinces and cities has become increasingly decentralized since the first certification of social enterprises. The development of the number of certified social enterprises in China is characterized by significant spatial non-equilibrium, which may be due to the fact that some provinces and municipalities have begun to have small groups of people who are exposed to social enterprises and promote the certification of social entrepreneurs within the small circle. China's social enterprises in 2015–2022 there is a right "trailing" phenomenon, the single-peak pattern gradually over to the double-peak pattern, indicating that China's social enterprises certified the number of high-value cities to increase the number of cities, but the change is not large, and there is a polarization of the phenomenon.

From the view of the overall trend of change, the kernel density curve, the waveform moves to the right (right skewed distribution), the vertical height of the peak decreases, the horizontal width increases, and the number of peaks increases, which means that its kernel density tends to move in the direction of the increasing value of the kernel density curve, which is becoming more and more flat, i.e., the total amount of certification of social enterprises in China's provincial areas is gradually rising, but the regional disparity is increasing, and the existence of the characteristics of the dynamics of dispersion. This may be due to the continuous deepening of inter-provincial exchanges in China.

4.3. Spatial clustering of China's social enterprise development model

The clustering results are shown in Fig. 8. From the classification results, the clustering of better developed areas of social enterprises in China's provinces breaks the traditional spatial and temporal boundaries, showing the characteristics of overall cross-domain dispersion and local aggregation, while the development level of the general distribution of provinces adjacent to each other. When the relative distance is greater than 8, the comprehensive profile coefficient and Davies-Bouldin index judge the clustering effect is better, China's provinces and cities are divided into the following 3 major categories:

The three types of provinces and municipalities were named as model provinces and municipalities for social enterprise development, social enterprise start-up provinces and municipalities, and provinces and municipalities lagging behind in social enterprise development according to their scale of development and the basis of development. The results of the clustering are shown in Fig. 9.

As can be seen from the results of hierarchical clustering, the three major categories of social enterprise development environment in China's existing provincial clustering gap are large. Social enterprise development has now begun to take shape in most of the provinces clustered in the first category, and the distance between the sub-clusters is also larger, proving that it has a different mode of development. The second and third category of clustering provinces and cities in the sub-cluster gap are larger compared to the distinctive characteristics of each. From the differences between sub-clusters and the regional differences within the categorized categories, it is clear that it is not appropriate to implement a one-size-fits-all development strategy in promoting the development of social enterprises in China, and that scientific, systematic and targeted guidance should be given to each city according to its different socio-economic characteristics. The characteristics of cities in each category are shown in Fig. 10 below:
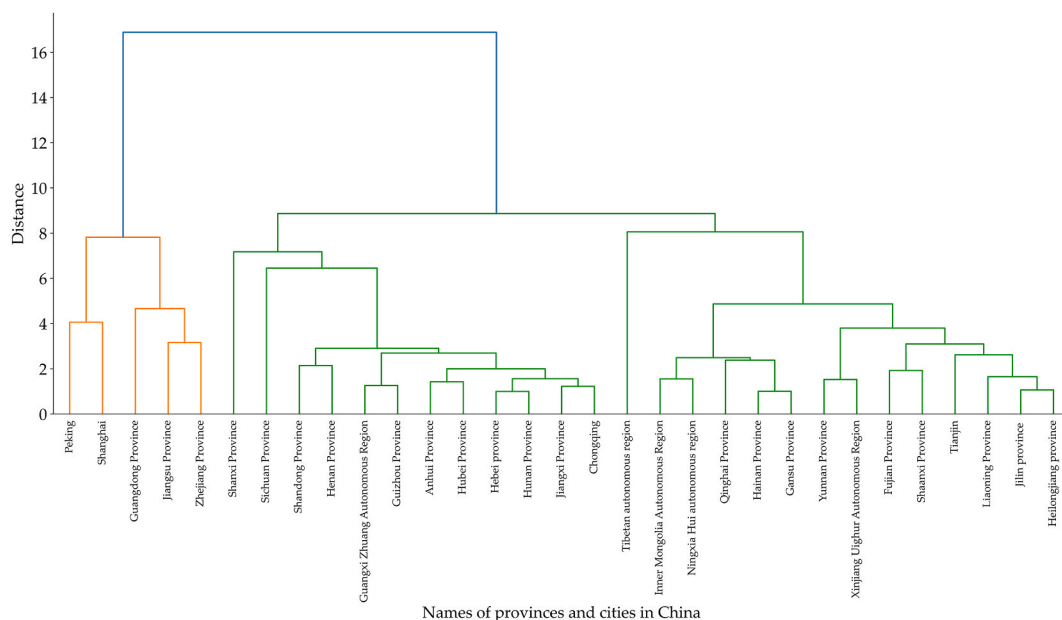

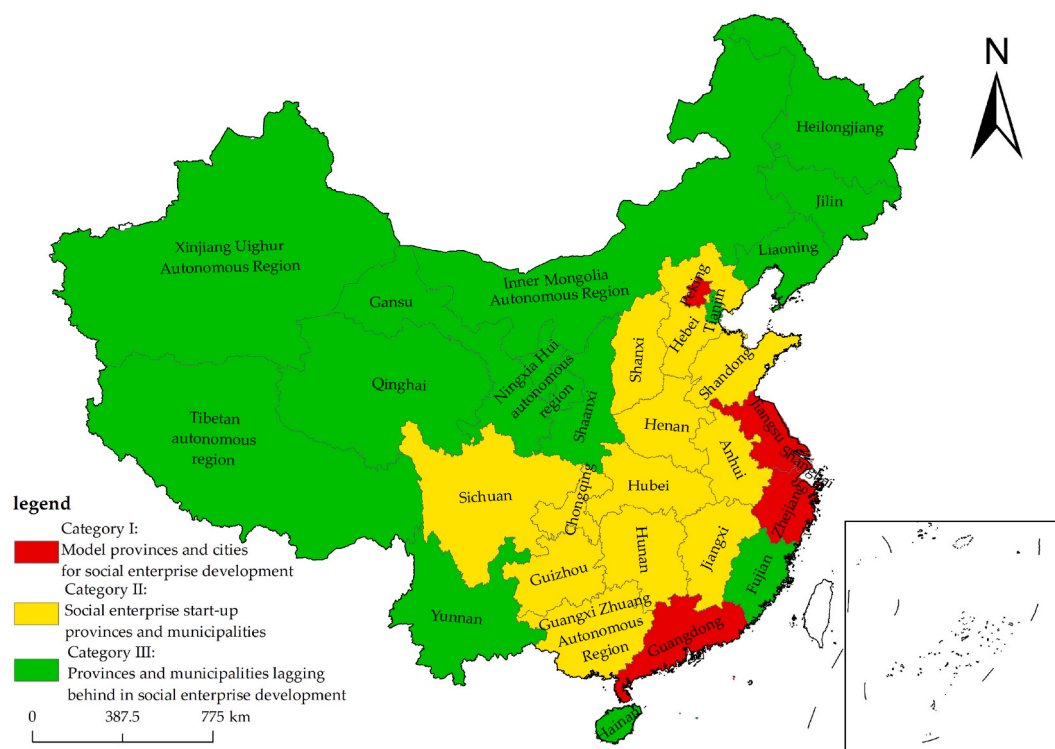**Fig. 8.** Hierarchical clustering Results.

Fig. 9. Spatial clustering display map of social enterprises in provinces and regions of mainland China.

To gain a deeper understanding of the characteristics of the three types of provinces and cities, this article uses box plots to describe the relevant features of each category. The model provinces and cities for social enterprise development do not have a big advantage over the other categories in terms of social demand and human resources, but their good policy attention and knowledge creation and circulation capabilities have contributed to the spread of social enterprises, and the original excellent social organization base and human resources attracted by the advantages of economic development have shown their advantages in the market-driven context, which has driven the vigorous development of social enterprises. From the shape of the box plot, except for the level of marketization and knowledge mobility data are more concentrated, the rest of the indicators are more dispersed; from the distribution of data, the more dispersed indicators in the atmosphere of social public welfare showed a clear left skewed, the rest of the indicators showed a right skewed, and the distribution of the skewness is stronger, which indicates that the provinces and cities in the category of the atmosphere of social public welfare are more better, but the data of the rest of the indicators are mostly at a relatively low level. This category can be roughly divided into three subclusters: the subcluster of Beijing and Shanghai has better policy attention, informatization level, and knowledge flow capacity than other provinces and cities in the same category, but still lacks in terms of social organizational development foundation. The subcluster of Guangdong province has higher levels of marketization, human resources, social welfare atmosphere, financial resource supply level, and regional innovation capabilities than other provinces and cities, but lacks in government policy attention. The subcluster of Jiangsu and Zhejiang provinces has higher levels of social demand, peer competition pressure, human resources, financial resource supply level, and regional innovation capabilities than other provinces and cities, but there is some lack in terms of knowledge creation and knowledge flow capabilities. In the process of promoting the development of social enterprises, the focus for this category of cities should be on how to make good use of technological and policy advantages, utilize their own resource endowments to gather human resources and other resource elements, and explore multiple models for the development of social enterprises.

The social enterprise start-up provinces and cities are better than the first category of cities in terms of social needs in general, while the rest of the indicators are in the middle range. From the shape of the box plot, such cities are more discrete with respect to the level of social demand, social public welfare atmosphere and regional innovation capacity, while the data of other indicators in the remaining provinces are more concentrated; from the distribution of the data, the level of social demand, the pressure of peer competition and the level of informatization show a significant left skewness, which suggests that the development environments of provinces and cities in which social enterprises are starting out are similar, but there is a distinction between them in terms of social demand, social public welfare atmosphere and regional innovation capacity. The category can be roughly divided into three sub-clusters: Shanxi Province is a sub-cluster, which has a good level of human resources, but is relatively deficient in terms of the level of marketization, the atmosphere of social public welfare, the supply of financial resources and the flow of knowledge. Sichuan Province is a sub-cluster, the province's social atmosphere and knowledge flow indicators are relatively outstanding, the rest of the indicators are in the same category of medium-high level, combined with the number of social enterprise certification analysis, the
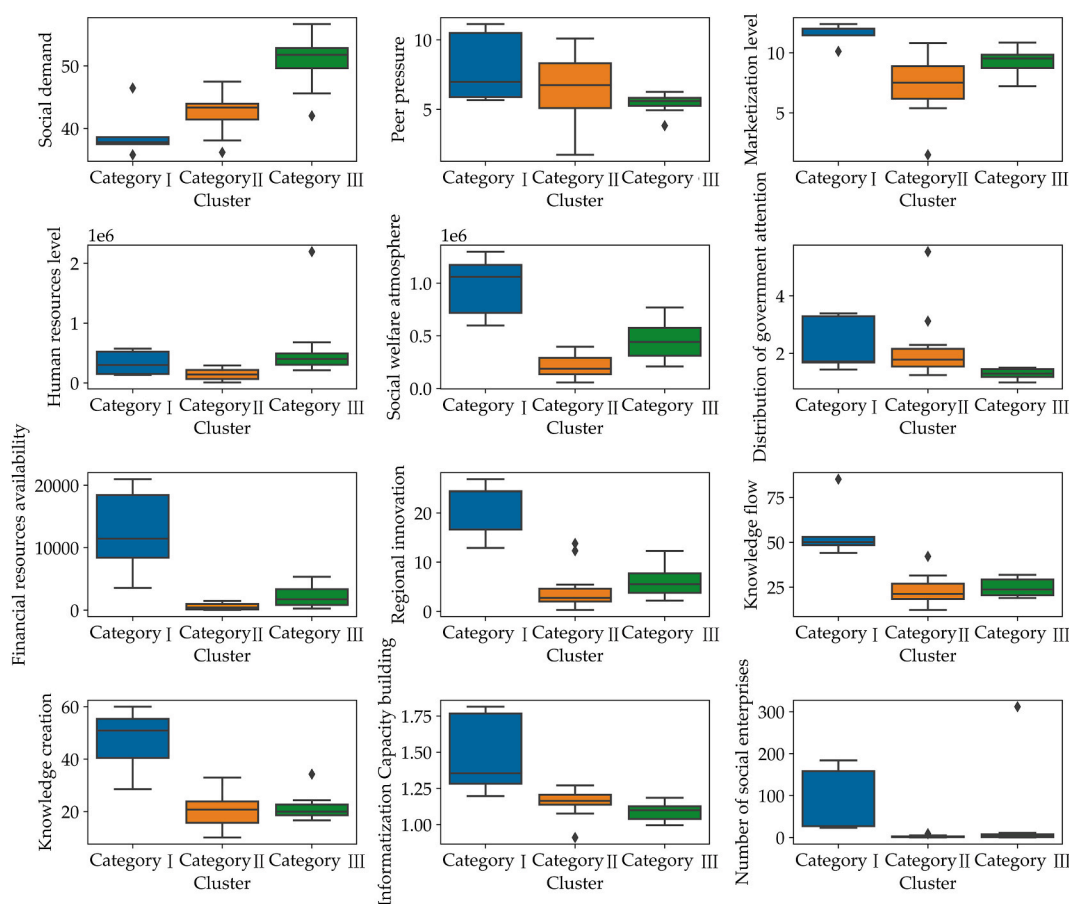
Fig. 10. Cluster characteristics of provincial social enterprises.

development of the remaining provinces and municipalities, except for Sichuan Province has not yet formed a certain scale, need to be further included in the indicators to consider the impact of the development of social enterprise factors. The remaining provinces and municipalities in this category are another sub-cluster, and most of the provinces and municipalities in this sub-cluster have short-comings in their indicators, such as the low level of financial resource provision in Guizhou Province. The focus of development in the second category of provinces and municipalities should be on fully driving the existing resource elements, gradually making up for the shortcomings in resources or exploring the characteristic development path.

The third category consists of provinces and cities with lagging social enterprise development. These provinces and cities have a certain gap in peer competition pressure, marketization level, and knowledge creation. From the shape of the box plot, the remaining indicators are relatively concentrated. From the data distribution, the level of social demand shows a left-skewed distribution, indicating that most of the provinces and cities in this category have a higher social demand. The social welfare atmosphere, government attention, regional innovation capacity, knowledge flow capacity, and level of informatization exhibit a right-skewed distribution, indicating that the data for these indicators in this category of provinces and cities are relatively high overall. This clustering can also be roughly divided into three subclusters: Subcluster 1 is the Tibet Autonomous Region, where all indicators are at a relatively low level. Subclusters 2 and 3 have relatively good and bad indicators for the provinces and cities, such as the shortcomings of Inner Mongolia Autonomous Region in social demand, marketization level, and fiscal resource supply, and the relatively good social organization foundation. Provincial and municipal social enterprise development indicators in the third category are generally at a poor level, and the development of social enterprises has a certain degree of contingency. The development of provinces and municipalities in this category has its own strengths and weaknesses, and the focus of development should be on guiding the participation of the government to gradually improve the capacity of knowledge creation and exchange, and to innovate the certification of social enterprises with the level of technology that adequately drives the different elements of the environmental environment for the development of social enterprises.

4.4. Exploring the mechanism of regional development impact on social enterprises in China

Taking social and economic factors into account and combining relevant literature and available data, in addition to selecting the

Table 2

Single factor detection results of provincial social enterprise distribution geographic detectors.

One-factor	Government Policies policy support	Informatization Capacity building	Knowledge flow	Knowledge creation	Regional innovation	Distribution of government attention	Financial resources availability	Social Welfare Climate	Human resources level	Marketization level	Peer pressure	Social demand
Nationwide	0.990442	0.335408	0.270086	0.21341	0.341066	0.511224	0.12202	0.468019	0.352099	0.236262	0.309541	0.043251
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Eastern part	0.976579	0.653143	0.207936	0.122764	0.137495	0.214827	0.300196	0.548218	0.409201	0.502355	0.937738	0.612007
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Middle part		0.854203	0.026474	0.677032	0.884977	0.860907	0.627106	0.597288	0.711843	0.462527	0.502702	0.682463
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Western part	0.999465	0.438582	0.561571	0.597919	0.999667	0.999593	0.234216	0.999605	0.76359	0.999584	0.322717	0.057298
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Standard errors in parentheses,*p < 0.1, **p < 0.05, ***p < 0.01.

Table 3
Detection results of interaction factors of geographical detectors in China's provinces.

One-factor	Government Policies policy support	Informatization Capacity building	Knowledge flow	Knowledge creation	Regional innovation	Distribution of government attention	Financial resources availability	Social welfare atmosphere	Human resources level	Marketization level	Peer pressure	Social demand
Government Policies policy support	0.9904 (BE)											
Informatization Capacity building	0.9967 (BE)	0.3354 (BE)										
Knowledge flow	0.9970 (BE)	**0.9365** (NE)	0.2701 (BE)									
Knowledge creation	0.9920 (BE)	**0.6517** (NE)	0.4715 (BE)	0.2134 (BE)								
Regional innovation	0.9975 (BE)	**0.9853** (NE)	0.4893 (BE)	0.3709 (BE)	0.3411 (BE)							
Distribution of government attention	0.9986 (BE)	0.9754 (NE)	0.7355 (BE)	0.7015 (BE)	0.5649 (BE)	0.5112 (BE)						
Financial resources availability	0.9970 (BE)	0.3524 (BE)	0.3637 (BE)	**0.3635** (NE)	**0.6503** (NE)	**0.7365** (NE)	0.1220 (BE)					
Social welfare atmosphere	0.9927 (BE)	**0.9762** (NE)	0.6931 (BE)	0.4683 (BE)	0.5623 (BE)	0.9643 (BE)	**0.9760** (NE)	0.4680 (BE)				
Human resources level	0.9990 (BE)	0.6501 (BE)	**0.7513** (NE)	0.3691 (BE)	0.5697 (BE)	0.7169 (BE)	**0.5169** (NE)	0.6936 (BE)	0.3521 (BE)			
Marketization level	0.9979 (BE)	**0.9724** (NE)	**0.5585** (NE)	**0.5714** (NE)	0.5735 (BE)	0.7213 (BE)	0.2913 (BE)	**0.7613** (NE)	**0.9617** (NE)	0.2363 (BE)		
Peer pressure	0.9973 (BE)	0.5261 (BE)	**0.7389** (NE)	0.4745 (BE)	0.5811 (BE)	**0.9958** (NE)	0.3414 (BE)	0.7271 (BE)	**0.7241** (NE)	**0.7350** (NE)	0.3095 (BE)	
Social demand	0.9973 (BE)	**0.4422** (NE)	**0.6535** (NE)	**0.6749** (NE)	**0.5652** (NE)	**0.7322** (NE)	**0.3964** (NE)	**0.6815** (NE)	**0.9705** (NE)	**0.7295** (NE)	**0.4479** (NE)	0.0433 (BE)

Note: BE indicates bifactorial enhancement and black bolded NE indicates nonlinear enhancement.

11 factors analyzed in the above clustering analysis, this paper uses the expert scoring method to measure the policy support environment dimension for geographical exploration.

First, a single-factor exploratory analysis is conducted to investigate the impact scale of individual factors on the spatial differentiation of social enterprise development in China and its sub-regions, as shown in Table 2.

From an overall perspective, the driving factors that impact the spatial differentiation pattern of social enterprises in China can be ranked in descending order as follows: government policy support (0.9904) > government attention allocation (0.5112) > social welfare atmosphere (0.4680) > human resources level (0.3521) > regional innovation capacity (0.3411) > information construction capacity (0.3354) > peer competition pressure (0.3095) > knowledge flow capacity (0.2701) > level of marketization (0.2363) > knowledge creation capacity (0.2134) > financial resource supply (0.1220) > social demand (0.0433). Among them, government policy support plays a decisive role, and the driving effects of social welfare atmosphere and government attention allocation are superior to other driving factors. The social demand driving factor explains the spatial differentiation pattern of social enterprises poorly, which indicates that the practical development of social enterprises in China is still in the early stages, and that the development of social enterprises shows randomness, which is consistent with the existing research.

In terms of regional differences, the characteristics of the driving factors that affect the spatial differentiation pattern of the eastern, central, and western regions of China show some variations. The main driving factors influencing the distribution pattern in the eastern region of China are government policy support (0.9766) > peer competition pressure (0.9377) > information construction capacity (0.6531) > social demand (0.6120) > social welfare atmosphere (0.5482) > marketization level (0.5024) > human resources level (0.4092). The driving characteristics of the eastern region can be categorized as environment-driven, and the development trend of social demand-pulled social enterprises in this type of provinces and cities is obvious, the government pays continuous attention to social enterprises, and the good environment for the development of social organizations, the information construction environment, the market environment, and the atmosphere of social public welfare promote the development of social enterprises. The driving factors affecting the distribution pattern of China's central region are mainly regional innovation capacity (0.8850) > government attention allocation (0.8609) > information construction capacity (0.8542) > human resources level (0.7118) > social demand (0.6824) > knowledge creation capacity (0.6770) > financial resource supply (0.6271) > social welfare atmosphere (0.5973) > peer competition pressure (0.5027) > marketization level (0.4625). The driving characteristics of the central region can be categorized as a balanced creation type, where the government pays general attention to social enterprises, and the balanced technological, organizational and market environments combined with social needs help the development of social enterprises. However, it should be noted that social enterprises are less influenced by knowledge flow in this region. The driving factors affecting the distribution pattern of China's western region are mainly regional innovation capacity (0.99966) > social welfare atmosphere (0.99961) > government attention allocation (0.99959) > marketization level (0.99958) > government policy support (0.99946). The western region is characterized as a differentiated communication-driven type, and the driving factors for the development of social enterprises in this type of provinces and cities vary greatly covering the three levels of technology, organization and environment, and under the government's attention, the development of social enterprises has been boosted by a favorable market atmosphere, public welfare atmosphere and innovation atmosphere.

To further explore the spatial differentiation mechanism of China's social enterprises, the interaction effects of the driving factors at the provincial level were analyzed. The results are shown in Table 3.

The combination of single-factor detection and interaction factor detection reveals that the spatial differentiation effect of all interaction factors on the provincial distribution of social enterprises is enhanced compared with the single-factor effect, which suggests that the provincial spatial differentiation of social enterprises is a result of multifactor nonlinear coupling. The key interaction factor with the highest level of determining power for the spatial differentiation of social enterprise certification is government policy support ∩ human resource level, indicating that government policy support and human resource level play a dominant role in the spatial differentiation pattern of social enterprises after spatial superposition, with a determining power of 0.9990. Apart from the factors related to government policy support, the key interacting factors that determine the level of decision-making are the abilities of informatization building capacity ∩ knowledge flow capacity, informatization building capacity ∩ regional innovation capacity, informatization building capacity ∩ government attention allocation, informatization building capacity ∩ social public welfare atmosphere, informatization building capacity ∩ marketization level, government attention allocation ∩ social public welfare atmosphere, government attention allocation, government attention allocation ∩ peer competition pressure, social demand ∩ human resource level and human resource level ∩ marketization level. allocation ∩ peer competition pressure, social public welfare atmosphere ∩ financial resources supply, social demand ∩ human resources level and human resources level ∩ marketization level, the determining power has exceeded 0.93. Moreover, these factors predominantly include information construction ability, government attention allocation, human resource level, and social welfare atmosphere. This indicates that the inclusion of these four key interacting factors has a more significant spatial overlay effect on the spatial differentiation pattern of social enterprises. The interaction factors in Table 3 that have a non-linear enhancing effect are mostly related to these factors, further confirming their spatial overlay effect.

Based on the results of the regional interaction factor analysis, it was concluded that all factors superimposed had an enhancing effect, but the focus of the effect varied between regions.

In the eastern region, the results of the interaction analysis show that the combination of fiscal resource supply and environmental factors other than social needs, the combination of information technology capabilities and organizational factors, the combination of social welfare atmosphere and marketization level, and the combination of knowledge creation capabilities and human resource level, as well as the combination of peer competition pressure, all have a nonlinear enhancing effect. In the central region, the results of the interaction analysis show that the combination of peer competition pressure and all factors except information technology capabilities

and social welfare atmosphere, the combination of social needs and regional innovation capabilities, and the combination of fiscal resource supply and marketization level, all have a nonlinear enhancing effect. In the western region, the results of the interaction analysis show that only the combination of peer competition pressure and knowledge flow capabilities has a nonlinear enhancing effect.

Based on the overall factor analysis of interaction, the enhancing effects can be roughly classified into four categories. First, the "social demand+" route, where the combination of social demand with any factors related to technology, organization, or environment, produces a nonlinear enhancing effect. This route has the highest explanatory power for the spatial differences of social enterprises at the provincial level. Second is the "policy support + feasible technology" route, in which government policy support plays a decisive role. Government financial resources, in conjunction with feasible technological capabilities and a favorable market environment, can enhance the ability to explain spatial differences. Third, the "environmental superposition effect" route, where under sufficient supply of financial resources, a good social welfare atmosphere, level of human resources, level of marketization, and peer competition mutually promote each other, thereby increasing the explanatory power for spatial differences of social enterprises. Fourth, the "technology dissemination" route, where a good foundation of information technology construction can promote social enterprise development in a favorable environment, leading to the scale-up of social enterprises.

5. Governance strategies for regional development of social enterprises in China

The regional development of social enterprises in China is significantly uneven in terms of the number of certifications, regionalization differences, social enterprise clustering, and driving factors.

Social enterprises are significantly influenced by government accreditation policies [43], mainly concentrated in Sichuan, Beijing, Guangzhou, Shanghai, Jiangsu, Hangzhou, and other areas. There are distinct regional characteristics and large disparities between provinces and cities, as well as between the eastern, central, and western regions. The overall scale of social enterprises is relatively low [10]. Based on the number of accreditations, the development of social enterprises can be divided into two stages: the first stage is the fluctuating growth period from 2015 to 2018, during which social enterprise accreditation was successively launched in various regions, leading to a dispersed distribution of social enterprises in China; the second stage, from 2019 to 2022, is a period of fluctuating development, with an increasing number of social enterprises and a trend towards more dispersed distribution. China's social enterprise provincial distribution briefly appeared significant high and low clustering, a long time to show a low-low clustering, social enterprise development of better regions showing fragmented distribution, no regional neighbors for the time being. With the improvement of the phenomenon of polarization of the two ends of the social enterprise, the future is expected to appear in the region of Jiangsu, Zhejiang, and Shanghai, the phenomenon of high and high clustering and regional neighbors. This study aims to propose governance strategies from both a macro-level and a segmented clustering perspective.

From a macro perspective, the comprehensive impact of technology, organization, and the environment should be balanced to achieve inclusive development of social enterprises. Firstly, based on the leadership of party building, we need to create a positive policy environment for social enterprises and promote the formulation of scientific policies. Social concepts and local institutional environments influence the sustainable growth of social enterprises [72], which requires the government to advocate and regulate effectively. Secondly, market investment rules should be respected [73], and the transformation of social organizations should be actively promoted to achieve inclusive development of social enterprises. However, it should be clarified that inclusive development is one of the facets of high-quality development. This does not imply lowering certification standards for social enterprises or neglecting supervision. Instead, it involves reshaping and upgrading the existing extensive development model. Thirdly, the development of social enterprises is a game of inventory, and social enterprise management should incorporate market operational awareness, leverage resource boundaries, and construct a public welfare ecosystem. Fourthly, the development of social enterprises has regional segmentation effects, so it is necessary to combine endogenous innovation with exogenous development and do a good job in the diffusion and migration of social enterprise management methods and policies [74]. For example, in Chengdu, there is a policy for social enterprise certification supported by professional institutions and overseen by the industrial and commercial department. Similarly, there is a social enterprise certification policy guided by the Social Enterprise Certification Review Committee under the supervision of the Beijing Civil Affairs Bureau.

In terms of the development of regional clustering, it is necessary to consider the characteristics of different types of provinces and cities and implement targeted governance strategies to promote the development of social enterprises in a more intensive and efficient manner. The first category, which mostly consists of demonstration provinces and cities for the development of social enterprises in the eastern region, has leading advantages in technology, organization, and environment. It can promote the scale of development of social enterprises by increasing the supply of financial resources, the construction capacity of provincial and municipal informatization, and the ability to create knowledge, and explore and improve the existing development model. The Beijing-Shanghai sub-cluster should gradually improve its policies on social enterprise development, and take advantage of its good level of policy attention, social organization development foundation and technological innovation strengths to conduct pilot projects to explore a sound social enterprise certification system. The Guangdong sub-cluster should expand the scope of legislation on social enterprise certification on the basis of continuing to give full play to the market innovation mechanism and social public welfare atmosphere. The Jiangsu and Zhejiang sub-clusters, on the other hand, should gradually strengthen the creation and circulation of knowledge, and fully drive the innovation-driven mechanism of social demand and a good social organization foundation. The second category, which mostly consists of provinces and cities in the central and eastern regions where social enterprises are in the initial stage, has strong social demand but significant gaps in organization and environment. Policy support and resource investment need to be improved. So they can formulate an endogenous and exogenous development strategy, actively leverage external dynamics to drive the development of the local

community, and promote cross-border integration and innovation in the development of social enterprises; They should actively engage with the government, while avoiding blindly copying and reproducing policies and systems. Instead, they can learn from the "Social Needs +" model and the other four routes of the development model. Shanxi Province should learn from the "policy technology + feasible technology" approach, cultivate social enterprises with strong policy support, and promote the improvement of social enterprise development factors. Sichuan Province should be based on the "social demand +" route and the stacked route of environmental effects to better drive the existing favorable environment. Regions such as Shandong Province should focus on the "technology dissemination" route, tell the story of social enterprises, and seek faster development of social enterprises. The third category, which mostly consists of provinces and cities with lagging development of social enterprises in the western region, has relatively poor soil for social enterprises. It is necessary to focus on the cultivation of social organizations and the construction of knowledge flow capacity, promote cross-border collaboration, and encourage the establishment of social enterprises in advantageous sectors to inject new vitality into socio-economic development. The development models of "social demand +" and "environmental superposition effect" can be used as references. The social enterprises in Tibet Autonomous Region and other underdeveloped provinces and cities lack the necessary conditions for development. However, there is still a demand for the development of social enterprises. Therefore, based on exploring social needs, a small number of social enterprises should be cultivated by utilizing relatively advantageous industrial strengths, spreading the concept of social enterprise development, and actively guiding social entrepreneurs to establish social enterprises.

6. Conclusions

From 2015 to 2022, the Moran's index of the distribution of social enterprises across provinces in China remained between −0.13 and 0.05. Combined with the p-value and z-value judgment that can be obtained, China's social enterprise distribution in 2015–2018 shows randomness, and the social enterprise release in 2019–2022 shows significant spatial negative correlation. Although a stable state has not been formed, it can be observed that there is a spatial accumulation effect in social enterprise certification. Further analysis using the local Moran's index indicates that the distribution of social enterprises across provinces in China exhibits a "local clustering, overall dispersion" spatial pattern. Inner Mongolia Autonomous Region has been consistently identified as a low-low significant cluster since 2017, and the development of China's social enterprises has formed the spatial pattern of "low remains low, high remains high," and there are path dependence, spatial dependence and regional isolation effects.

From 2015 to 2022, China's provincial social enterprise kernel density curve shows an obvious "unipolar" phenomenon, with a trend of transitioning to a "bimodal" shape. The bandwidth of the curve increased each year, indicating that the regional disparity of social enterprises continued to grow, leading to a significant spatial imbalance. The systematic clustering will categorize provinces and cities in China into three groups. The results of the first category show a decentralized, cross-domain distribution characteristic, while the remaining two categories exhibit strong regional continuity. The first category of provinces and cities with better development of social enterprises is the focus of exploring the mode of development of China's social enterprises; the second is a stalwart of the development of social enterprises; and the third category of clustering still needs to be developed and perfected in response to its own weaknesses.

From the single-factor detection analysis, it can be seen that there are significant differences in the dominant factors and their decision levels of the spatial differentiation pattern of the development of social enterprise in China, in which the government policy support plays a decisive role, and the decisive forces are, in descending order, the government policy support, government attention distribution, social Welfare Atmosphere, the level of human resources, the regional innovation capacity, the capacity of informationization, the pressure of peer competition, knowledge flow capacity, the level of marketization, knowledge creation capacity, financial resource supply, and social demand. Knowledge flow capacity, marketization level, knowledge creation capacity, financial resource supply, and social demand. In terms of regional driving characteristics, the eastern region can be categorized as environment-driven, the central region can be categorized as equilibrium-created, and the western region can be categorized as technology diffusion-driven. From the perspective of interaction factors, all interaction factors increase the spatial differentiation pattern of the number of social enterprises compared to a single factor. The key interaction factors, including informationization construction capacity, government attention allocation, human resource level, and social welfare atmosphere, have a more significant spatial superposition effect on the spatial differentiation pattern of social enterprises in China.

Based on the existing clustering of social enterprise development and the soil of social regional development in China, the following governance strategies are proposed: First, in the demonstration provinces and cities for social enterprise development, market investment laws such as social demand-driven should be gradually drawn upon, and the leading role of key focus points such as the supply of financial resources, informationization construction capacity and knowledge creation capacity should be brought into play, so as to explore diversified paths for the large-scale development of social enterprises in China. Secondly, in the provinces and cities where the development of social enterprises has started, the focus is on solving the problem of regional segregation in the development of social enterprises, taking the pressure of peer competition, social demand, the supply of financial resources, the ability to build information technology and the ability to create knowledge as the focus points, and flexibly adopting such strategies as "social demand +", "policy support + viable technology", "environmental superimposed effect" and "technology dissemination", so as to stimulate the growth and development of social enterprises in various fields. Finally, in provinces and municipalities lagging behind in the development of social enterprises, the focus has been on breaking through the regional compartmentalization of social enterprises and gaming the stock, focusing on the cultivation of social organizations and the building of capacity for knowledge mobility, and adopting the strategies of "social demand plus" and "environmental superimposed effect" to promote the rapid emergence and development of social enterprises in the social economy.

This study can provide individualized development paths for different types of provinces and municipalities, and promote the emergence of social enterprises in various fields. However, due to the fact that the development of social enterprises in China is still at an early stage, future research can explore richer analytical frameworks and governance strategies for regional development on the basis of richer elements of the development of social enterprise practices and more comprehensive indicators of regional development. Future research could also target a particular aspect of China's social enterprise development for deeper study or uncover more meaningful findings.

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Data availability statement

This study uses accurate and reliable data, all of which can be obtained from public sources. Social enterprise certification data is sourced from the China Charity Fair (https://www.cncf.org.cn/cms/content/10308), Beijing Social Enterprise Certification Platform (http://bj.socialenterprisechina.com/), Chengdu Social Enterprise Certification Center (http://cd.socialenterprisechina.com/index.html), Shunde Social Enterprise Website (http://www.ss-ic.org.cn/index/passage/details.html?artid=796), and the Social Enterprise Service Platform (https://csecc.csedaily.com/cityList?type=minglu).

CRediT authorship contribution statement

Liu Xiaoxia: Writing – original draft, Visualization, Validation, Supervision, Resources, Methodology, Investigation, Funding acquisition. **Da Lv:** Writing – original draft, Visualization, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

[1] R.D. Ireland, M.C. Withers, J.S. Harrison, D.S. Boss, R. Scoresby, Strategic entrepreneurship: a review and research agenda, Entrep. Theory Pract. 47 (2) (2023) 495–523, https://doi.org/10.1177/10422587221111727.

[2] M. Calderini, M. Fia, F. Gerli, Organizing for transformative innovation policies: the role of social enterprises. Theoretical insights and evidence from Italy, Res. Pol. 52 (7) (2023), https://doi.org/10.1016/j.respol.2023.104818.

[3] M. Besharov, Innovation and scaling for impact: how effective social enterprises do it, Adm. Sci. Q. 64 (2) (2019) NP19–NP21, https://doi.org/10.1177/0001839219840644.

[4] A. Drencheva, W.C. Au, Bringing the family logic in: from duality to plurality in social enterprises, J. Bus. Ethics 182 (1) (2023) 77–93, https://doi.org/10.1007/s10551-021-04968-0.

[5] P.K. Hota, B. Subramanian, G. Narayanamurthy, Mapping the intellectual structure of social entrepreneurship research: a citation/Co-citation analysis, J. Bus. Ethics 166 (1) (2020) 89–114, https://doi.org/10.1007/s10551-019-04129-4.

[6] E. Bidet, J. Defourny, H.S. Eum, Social enterprise in South Korea: history and diversity, Soc. Enterp. J. 7 (1) (2011) 69–85, https://doi.org/10.1108/17508611111130167.

[7] 장석인, A comparative study on the social enterprise: focus on the U.S. And European union, Korean Rev. Corp. Manage. 3 (2) (2012) 79–95. https://www.jstor.org/stable/27928029.

[8] Y.C. Wu, Y.J. Wu, S.M. Wu, Development and challenges of social enterprises in taiwan from the perspective of community development, Sustainability 10 (6) (2018), https://doi.org/10.3390/su10061797.

[9] T.S. Cui, J.A. Kerlin, China: the diffusion of social enterprise innovation: exported and imported international influence, in: Shaping Social Enterprise, 2017, pp. 79–107, https://doi.org/10.1108/978-1-78714-250-320171004.

[10] J.A. Kerlin, S. Peng, T.S. Cui, Strategic responses of social enterprises to institutional pressures in China, J. Asian Public Policy 14 (2) (2020) 200–224, https://doi.org/10.1080/17516234.2020.1848249.

[11] B. Bhatt, I. Qureshi, S. Riaz, Social entrepreneurship in non-munificent institutional environments and implications for institutional work: insights from China, J. Bus. Ethics 154 (3) (2019) 605–630, https://doi.org/10.1007/s10551-017-3451-4.

[12] J.A. Kerlin, The macro-institutional social enterprise framework: introduction and theoretical underpinnings, in: Shaping Social Enterprise, 2017, pp. 1–26, https://doi.org/10.1108/978-1-78714-250-320171001.

[13] C. Serres, M. Hudon, F. Maon, Social corporations under the spotlight: a governance perspective, J. Bus. Ventur. 37 (3) (2022), https://doi.org/10.1016/j.jbusvent.2022.106192.

[14] P.K. Hota, Tracing the intellectual evolution of social entrepreneurship research: past advances, current trends, and future directions, J. Bus. Ethics 182 (3) (2023) 637–659, https://doi.org/10.1007/s10551-021-04962-6.

[15] A. Ranville, M. Barros, Towards normative theories of social entrepreneurship. A review of the top publications of the field, J. Bus. Ethics 180 (2) (2022) 407–438, https://doi.org/10.1007/s10551-021-04867-4.

[16] S. Dorado, Y. Chen, A.M. Prado, V. Simon, Attuned HRM systems for social enterprises, J. Bus. Ethics 178 (3) (2022) 829–848, https://doi.org/10.1007/s10551-021-04821-4.

[17] C. Busch, H. Barkema, Align or perish: social enterprise network orchestration in Sub-Saharan Africa, J. Bus. Ventur. 37 (2) (2022), https://doi.org/10.1016/j.jbusvent.2021.106187.

[18] J.A. Brown, W.R. Forster, A.C. Wicks, The fork in the road for social enterprises: leveraging moral imagination for long-term stakeholder support, Entrep. Theory Pract. 47 (1) (2023) 91–112, https://doi.org/10.1177/10422587211041485.

[19] S.D. Phillips, B. Johnson, Inching to impact: the demand side of social impact investing, J. Bus. Ethics 168 (3) (2021) 615–629, https://doi.org/10.1007/s10551-019-04241-5.

[20] E.A.R. Fowler, B.S. Coffey, H.R. Dixon-Fowler, Transforming good intentions into social impact: a case on the creation and evolution of a social enterprise, J. Bus. Ethics 159 (3) (2019) 665–678, https://doi.org/10.1007/s10551-017-3754-5.

[21] C. Savarese, B. Huybrechts, M. Hudon, The influence of interorganizational collaboration on logic conciliation and tensions within hybrid organizations: insights from social enterprise-corporate collaborations, J. Bus. Ethics 173 (4) (2021) 709–721, https://doi.org/10.1007/s10551-020-04557-7.

[22] S.A. Fernhaber, H. Zou, Advancing societal grand challenge research at the interface of entrepreneurship and international business: a review and research agenda, J. Bus. Ventur. 37 (5) (2022), https://doi.org/10.1016/j.jbusvent.2022.106233.

[23] P.K. Hota, B. Bhatt, I. Qureshi, Institutional work to navigate ethical dilemmas: evidence from a social enterprise, J. Bus. Ventur. 38 (1) (2023), https://doi.org/10.1016/j.jbusvent.2022.106269.

[24] K. Au, S.S. Jeong, A.J.C. Hsu, Y. Xiao, When does prosocial motivation deliver? A dual-motivations approach to social enterprise outcomes, J. Bus. Ethics (2023), https://doi.org/10.1007/s10551-023-05452-7.

[25] W.K. Smith, M.L. Besharov, Bowing before dual gods: how structured flexibility sustains organizational hybridity, Adm. Sci. Q. 64 (1) (2019) 1–44, https://doi.org/10.1177/0001839217750826.

[26] J.-B. Litrico, M.L. Besharov, Unpacking variation in hybrid organizational forms: changing models of social enterprise among nonprofits, J. Bus. Ethics 159 (2) (2019) 343–360, https://doi.org/10.1007/s10551-018-4047-3.

[27] N. Palakshappa, S. Dodds, S. Grant, Tension and paradox in women-oriented sustainable hybrid organizations: a duality of ethics, J. Bus. Ethics (2023), https://doi.org/10.1007/s10551-023-05422-z.

[28] A.A. Lashitew, O. Branzei, R. van Tulder, Community inclusion under systemic inequality: how for-profit businesses pursue social purpose, J. Manag. Stud. (2023), https://doi.org/10.1111/joms.12907.

[29] V. Cavotta, S. Mena, Prosocial organizing and the distance between core and community work, Organ. Stud. 44 (4) (2023) 637–657, https://doi.org/10.1177/01708406221099696.

[30] B. Martin, L. Walsh, A. Keating, S. Geiger, The demise of a rising social enterprise for persons with disabilities: the ethics and the uncertainty of pure effectual logic when scaling up, J. Bus. Ethics (2023), https://doi.org/10.1007/s10551-023-05390-4.

[31] Xiaoyuan Liu, Ziqi Lan, Jianxin Ge, Impact of opportunity Co-creation behaviour on the growth of social enterprises - the moderating role of corporate resources, Res Dev Manag 31 (1) (2019) 21–32, https://doi.org/10.13581/j.cnki.rdm.2019.01.004.

[32] Tiejun Wen, China's ecological civilisation transition and social enterprise inheritance, J China Agric Univ Soc Sci Ed 36 (3) (2019) 111–117, https://doi.org/10.13240/j.cnki.caujsse.2019.03.013.

[33] Lirong Shi, Meimei Xu, Xiaowei Jia, The emergence and development model of social enterprises in China since the founding of the PRC, Dongyue Lunjian Ser 32 (9) (2011) 159–163, https://doi.org/10.15981/j.cnki.dongyueluncong.2011.09.022.

[34] Y. Gao, T. Hafsi, Government intervention, peers' giving and corporate philanthropy: evidence from Chinese private SMEs, J. Bus. Ethics 132 (2) (2015) 433–447, https://doi.org/10.1007/s10551-014-2329-y.

[35] Xiaomin Yu, Zun Zhang, Haoyu Xia, Study on the social impact enhancement model and effectiveness of social enterprises in China, Comp Econ Soc Instit 1 (2023) 93–104, https://doi.org/10.3969/j.issn.1003-3947.2023.01.009.

[36] Yizhao Zhang, Value interpretation and subject construction of social enterprises under the perspective of third distribution, J Henan Univ Finance Econ Law 38 (1) (2023) 71–81, https://doi.org/10.3969/j.issn.2095-3275.2023.01.008.

[37] Zhiyang Liu, Liping Xu, Institutions and social entrepreneurship: an integrative framework based on the literature, Econ. Manag. 44 (1) (2022) 192–208, https://doi.org/10.19616/j.cnki.bmj.2022.01.011.

[38] Yi Kun Zhu, Dai Shun Zhou, Corporatisation of social enterprises and company law responses, J Beijing Inst Technol Soc Sci Ed 25 (2) (2023) 69–79, https://doi.org/10.15918/j.jbitss1009-3370.2023.0926.

[39] J.A. Kerlin, Defining social enterprise across different contexts: a conceptual framework based on institutional factors, Nonprofit Voluntary Sect. Q. 42 (1) (2013) 84–108, https://doi.org/10.1177/0899764011433040.

[40] B. Jeong, A. Janelle, D. Kerlin, The developmental state and social enterprise in South Korea, Soc Enterprise J 11 (2) (2015) 116–137, https://doi.org/10.1108/sej-01-2014-0005.

[41] R. Fisac-Garcia, A. Moreno-Romero, Spain: understanding social enterprise country models across time and sub-country regions, in: Shaping Social Enterprise, 2017, pp. 139–167, https://doi.org/10.1108/978-1-78714-250-320171006.

[42] S. Gatica, A. Janelle, D. Kerlin, Understanding the phenomenon of Chilean social enterprises under the lens of Kerlin's approach, Soc Enterprise J 11 (2) (2015) 202–226, https://doi.org/10.1108/sej-02-2014-0013.

[43] J.A. Kerlin, Theory of social enterprise and pluralism: social movements, solidarity economy, and the global South, Nonprof. Pol. Forum 10 (4) (2019), https://doi.org/10.1515/npf-2019-0062.

[44] J. Barraket, H. Douglas, R. Eversole, C. Mason, J. McNeill, B. Morgan, Classifying social enterprise models in Australia, Soc Enterprise J 13 (4) (2017) 345–361, https://doi.org/10.1108/sej-09-2017-0045.

[45] S. Calonico, M.D. Cattaneo, M.H. Farrell, On the effect of bias estimation on coverage accuracy in nonparametric inference, J. Am. Stat. Assoc. 113 (522) (2018) 767–779, https://doi.org/10.1080/01621459.2017.1285776.

[46] Xunxian Guo, Yuping Liu, Urban differences and dynamic changes in home purchase pressure: measurement and analysis, Stat Decision Making (6) (2023) 149–154, https://doi.org/10.13546/j.cnki.tjyjc.2023.06.027.

[47] D.F. Rogers, R.D. Plante, R.T. Wong, J.R. Evans, Aggregation and disaggregation techniques and methodology in optimization, Oper. Res. 39 (4) (1991) 553–582, https://doi.org/10.1287/opre.39.4.553.

[48] J.-F. Wang, X.-H. Li, G. Christakos, Y.-L. Liao, T. Zhang, X. Gu, X.-Y. Zheng, Geographical detectors-based health risk assessment and its application in the neural tube defects study of the heshun region, China, Int. J. Geogr. Inf. Sci. 24 (1) (2010) 107–127, https://doi.org/10.1080/13658810802443457.

[49] Y. Ding, M. Zhang, X. Qian, C. Li, S. Chen, W. Wang, Using the geographical detector technique to explore the impact of socioeconomic factors on PM2.5 concentrations in China, J. Clean. Prod. 211 (2019) 1480–1490, https://doi.org/10.1016/j.jclepro.2018.11.159.

[50] R. Luo, N. Zhou, Dynamic evolution, spatial differences, and driving factors of China's provincial digital economy, Sustainability 14 (15) (2022), https://doi.org/10.3390/su14159376.

[51] K. Zhu, K.L. Kraemer, S. Xu, J. Dedrick, Information technology payoff in e-business environments: an international perspective on value creation of e-business in the financial services industry, J. Manag. Inf. Syst. 21 (1) (2004) 17–54, https://doi.org/10.1080/07421222.2004.11045797.

[52] S.H.-W. Chuah, M.-L. Tseng, K.-J. Wu, C.-F. Cheng, Factors influencing the adoption of sharing economy in B2B context in China: findings from PLS-SEM and fsQCA, Resour. Conserv. Recycl. 175 (2021), https://doi.org/10.1016/j.resconrec.2021.105892.

[53] J. Xiao, L. Han, H. Zhang, Exploring driving factors of digital transformation among local governments: foundations for smart city construction in China, Sustainability 14 (22) (2022), https://doi.org/10.3390/su142214980.

[54] S. Wang, Y. Gao, H. Zhou, Research on green total factor productivity enhancement path from the configurational perspective-based on the TOE theoretical framework, Sustainability 14 (21) (2022), https://doi.org/10.3390/su142114082.

[55] S. Chen, B. Lei, H. Feng, Research on configurational path of industrial digitization between developed regions and underdeveloped regions —Based on Technology - organization - Environment framework, Studies Sci Sci 40 (3) (2022) 410–419, https://doi.org/10.1080/13662716.2018.1535429, 453.

[56] X. Lin, Y. Zhao, M. Ahmad, Z. Ahmed, H. Rjoub, T.S. Adebayo, Linking innovative human capital, economic growth, and CO2 emissions: an empirical study based on Chinese provincial panel data, Int. J. Environ. Res. Publ. Health 18 (16) (2021), https://doi.org/10.3390/ijerph18168503.

[57] C. Jiakui, J. Abbas, H. Najam, J. Liu, J. Abbas, Green technological innovation, green finance, and financial development and their role in green total factor productivity: empirical insights from China, J. Clean. Prod. 382 (2023), https://doi.org/10.1016/j.jclepro.2022.135131.

[58] C.J. Soon, K. Byoung-Jun, An exploratory study on the regional distribution of social enterprises, J Regional Stud Dev 22 (1) (2013) 119–142, https://doi.org/10.19420676.2014.954255.

[59] N. Buratti, C. Sillig, M. Albanese, Community enterprise, community entrepreneurship and local development: a literature review on three decades of empirical studies and theorizations, Enterpren. Reg. Dev. 34 (5–6) (2022) 376–401, https://doi.org/10.1080/08985626.2022.2047797.

[60] A. Sammarra, L. Biggiero, Heterogeneity and specificity of inter-firm knowledge flows in innovation networks, J. Manag. Stud. 45 (4) (2008) 820–829, https://doi.org/10.1111/j.1467-6486.2008.00770.x.

[61] D.M. Kirkman, Social enterprises: a multi-level framework of the innovation adoption process, Innov Organ Manag 14 (1) (2012) 143–155, https://doi.org/10.5172/impp.2012.14.1.143.

[62] M.D.N. Islam, W. Ozuem, G. Bowen, M. Willis, R. Ng, An empirical investigation and conceptual model of perceptions, support, and barriers to marketing in social enterprises in Bangladesh, Sustainability 13 (1) (2021), https://doi.org/10.3390/su13010345.

[63] T. Saebi, N.J. Foss, S. Linder, Social entrepreneurship research: past achievements and future promises, J. Manag. 45 (1) (2019) 70–95, https://doi.org/10.1177/0149206318793196.

[64] J. Mair, J. Mayer, E. Lutz, Navigating institutional plurality: organizational governance in hybrid organizations, Organ. Stud. 36 (6) (2015) 713–739, https://doi.org/10.1177/0170840615580007.

[65] S. Zainon, S.A. Ahmad, R. Atan, Y.B. Wah, Z. Abu Bakar, S.R. Sarman, Legitimacy and Sustainability of Social Enterprise: Governance and Accountability, Int Conf Corp Governance Strategic Manag (ICGSM), Manchester, ENGLAND, 2014, pp. 152–157, https://doi.org/10.1016/j.sbspro.2014.06.022, 2014 Apr 14-17, 2014; Manchester, ENGLAND.

[66] Jia-Ping Xie, Lu-Hao Liu, Ling Liang, Social Enterprises, Development heterogeneity, current positioning and business model innovation, Econ. Manag. 38 (4) (2016) 190–199, https://doi.org/10.19616/j.cnki.bmj.2016.04.018.

[67] Zhiyang Liu, Xinhe Zhuang, Bin Li, Geographic Scope, Attention allocation and social enterprise mission deviation, Econ. Manag. 41 (8) (2019) 73–90, https://doi.org/10.19616/j.cnki.bmj.2019.08.005.

[68] Xiaochun Ge, Liu Hu, Xueying Tian, Dengke Ge, Knowledge acquisition of organisational entrepreneurial resources under multiple institutional logics - a case study of non-profit organisations transforming into social enterprises, Manage Case Stud Rev 14 (2) (2021) 192–204, https://doi.org/10.1016/j.mar.2016.07.006.

[69] G. Desa, S. Basu, Optimization or bricolage? Overcoming resource constraints in global social entrepreneurship, Strateg. Entrep. J. 7 (1) (2013) 26–49, https://doi.org/10.1002/sej.1150.

[70] G. Liu, T.-Y. Eng, S. Takeda, An investigation of marketing capabilities and social enterprise performance in the UK and Japan, Entrep. Theory Pract. 39 (2) (2015) 267–298, https://doi.org/10.1111/etap.12041.

[71] A.-C. Pache, F. Santos, Inside the hybrid organization: selective coupling as a response to competing institutional logics, Acad. Manag. J. 56 (4) (2013) 972–1001, https://doi.org/10.5465/amj.2011.0405.

[72] T. Warnecke, Social entrepreneurship in China: driving institutional change, J. Econ. Issues 52 (2) (2018) 368–377, https://doi.org/10.1080/00213624.2018.1469866.

[73] B. Doherty, H. Haugh, F. Lyon, Social enterprises as hybrid organizations: a review and research agenda, Int. J. Manag. Rev. 16 (4) (2014) 417–436, https://doi.org/10.1111/ijmr.12028.

[74] A.-S.T. Olanrewaju, M.A. Hossain, N. Whiteside, P. Mercieca, Social media and entrepreneurship research: a literature review, Int. J. Inf. Manag. 50 (2020) 90–110, https://doi.org/10.1016/j.ijinfomgt.2019.05.011. **Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.