Research on the Spatial Arrangement of Retail Business in the Central City of China's Megacity-A Case Study of Nanjing

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Abstract: Urban retail business development is an extremely important factor in promoting the development of urban physical space and socio-economic culture. Urban retail commercial space layout is the geographical distribution and geographical combination of commodity circulation network, and it is one of the research areas in the development of urban central area space. In recent years, the research on the urban center area has mainly focused on the perspective of land use and so on. From the perspective of industry, it is rare to study the urban center area. With the advent of the era of big data, this paper takes the Xinjiekou Central District of Nanjing as an example to obtain a POI data acquisition database, and analyzes the spatial layout of retail business in Nanjing. Based on the quantity and structure of land use in Nanjing and the direction of urban expansion, the relationship between the expansion of urban land use industry and retail business space is analyzed, which provides a guide for the research on the retail business status in urban centers.

1. Introduction

With the rapid development of China's economy, consumption has gradually diversified, and China has formed a huge retail market. Retailing has become an important part of the Chinese economy. With the continuous development of the Internet and information technology, social research has entered the era of big data. The type of retail business mode is also more diversified and refined based on the choice of different modes. The analysis of the overall business status of the business through new technical means helps to grasp the layout and cyclical development of the business in different city-level locations, and guides the adjustment of long-term business development and layout development.

At present, the theory of the evolution of the retail business industry considers that the study of the central area is not perfect from the perspective of poi quantification. It cannot fully explain all the rules of the evolution and development of the retail business industry. It needs to elaborate on the evolution

of the retail business model from a more microscopic perspective. Yang Junyan (2016) had studied the central area of the city from another angle. Therefore, it is necessary to introduce new technical analysis methods in the new era and quantify related indicators to study the relationship between retail business formats and urban spatial structure and evolution under the influence of different elements.

Chinese scholars' research on the retail business model mainly explains the pattern of business evolution from the angle of the economic system, the introduction of advanced retail business in Western countries, and the characteristics of the organization of the company.

(I) Research on the evolution pattern of retail business in China

In the past 10 years, Chinese scholars have studied the evolution of retail business structure mainly along two lines:1. The emerging market represented by supermarkets has replaced large-scale department stores with a traditional format, which is the format innovation of retail commerce. 2. To reshape China's retail business organizations in a chain-operating manner so that they can achieve new development in the process of uniting, that is, reorganization of retail commerce. Liu Xiaoxue (2009) pointed out that growth, income diversification, chain model and foreign investment are the main reasons for the creation and development of the new pattern of traditional department store formats and retail formats.

Chinese scholars believe that the retail business format refers to the business status and form of the city's business. The content includes the commercial facilities, their location and scale, product distribution and sales services, etc. Retail business in economics includes both physical stores and intangible virtual shops. Retail business development is constantly evolving with the development of social and economic conditions and technological means.

Based on the development of the western retail business, Western scholars put forward relevant retail theories and systematically summarized the evolution of retail business. In general, western retail theory can be divided into circular theory and evolution theory.

(I) The retail business cycle theory

The retail life cycle theory is a theory that considers the evolution of retail business in the west as a cyclical process. It mainly includes the following three theories:

1) Life cycle theory. This hypothesis was jointly proposed by Davidson, W.R、 Bates, A.D and Bass, S.J. This hypothesis applies the product life cycle theory to explain the development process from production to recession. At each stage of the retail life cycle, the retail business model will exhibit phased characteristics.

2) The Wheel of Retailing. American retail expert McNeil believes that lower prices, profits, and positioning are the three characteristics of the innovative retail business model, making it more competitive than the old retail business enterprises. However, as business operations continue, in order to provide consumers with better services, retail companies will often draw on a series of adjustment measures. These measures will increase operating costs, thereby weakening the advantages and eventually replacing the new retail business, Cycling in such a model.

3) Comprehensive and professional cycle theory. This theory holds that the development of retail business is a process of "convergence-professional-reintegration". Although the theory of retail specialization and integration cycle has developed more than the previous two theories, its interpretation and forecasting business structure of retail business calculus can only be used to describe the evolution of the format, without pointing out the evolution of the retail business landscape evolution. In addition, the description of the evolution of the retail business model is influenced by the corresponding historical period and the object of observation.

(II) Evolution of retail business development

The evolutionary ideas in the western retail business theory mainly include natural selection theory and dialectical process theory.

1) The theory of natural selection brings the Darwinian "survival of the fittest" into the evolution of retail business formats. Nelson and Winter believe that the adaptation of retail business to the external environment is crucial. Taking Japan as an example, the trend of department store upsizing in recent years is a transformation of traditional department stores. Summarizing the rules of the evolution of

retail business in the West, we can see that there are also degenerative phenomena in the evolution of the format. In the process of sustained competition, the original dominant format gradually loses its dominance and the development speed slows down until it is replaced by the postponed format.

2) The dialectical process theory holds that the evolution of the retail business structure is a process in which the retail business formats and their advantageous characteristics are opposed to one another, mimicking each other and integrating with each other. When confronted with the challenge of innovative retail companies, traditional retail business enterprises usually absorb some of the other side's advantages and adopt a business strategy that is similar to the other side, thus eliminating mutual competitive advantages. Eventually both parties will achieve convergence in the commodity mix, indoor environment, service quality and product prices. The emergence of new retail business forms eventually led to the evolution of "opposition-convergence-against-reconvergence".

This article attempts to explore the spatial structure of retail business in Nanjing's downtown area by studying the clustering characteristics of retail commerce under the retail business POI data in urban centers. From the perspective of urban planning disciplines, this paper analyzes the status quo and development of retail commercial space structure in central urban areas, and combines related theories to reveal the spatial distribution pattern of retail commercial space in different types of blocks, and then studies the spatial structure of retail business formats in the central area.

The remainder of this article is structured as follows. The second part explains why we focused our analysis on Nanjing and introduced our research methods. The third part describes the basic characteristics of the spatial distribution of the pattern in Nanjing, and the fourth part summarizes the basic rules of spatial distribution of pattern in the Xinjiekou area of Nanjing. The fifth part of the study of the Xinjiekou plot, according to the development of retail business in Nanjing city, put forward the policy recommendations for the retail commercial space layout in Nanjing.

2. Case Selection and Methods

2.1. Case Selection
Nanjing is China's megacity center and one of the most developed regions in China. In 2017, Nanjing has a population of about 800.47 million, and Nanjing has a GDP of about RMB 111.51 billion. Nanjing's urban business is very developed. The selection of Nanjing is typical for the study of the central area of the city. Therefore, choose Nanjing's central area for research.
Shi Beixiang proposed a method for defining the spatial boundaries of the urban center area. This method has been repeatedly applied and reached a certain level of consensus. Here, we determine the central area of Nanjing through this method. The technical process of quantifying the boundary of the urban center area: First, determine the measure index that can reflect the function of the center area, and then determine the combined cut-off value of the public service facility index in the center area of the city according to the investigation results of the city's current situation; organize the data and draw the spatial distribution map of the index; Finally, the boundary of the center area is defined.

Quoted by this figure
Figure 1. Current status of Nanjing Central District

2.2. Kernel density analysis
There are two modes Pattern analysis points in space research methods: a method based on the distance to the dispersion baseline and the density-based methods (polymerized baseline) (i.e., sample analysis, kernel density estimation, hot Analysis, etc.) Format can be viewed as a set of points in the continuous space, a large number of difficult to express the spatial distribution of point format based on the distance method, a better density-based expression, having better visualization resistance. Therefore, this paper uses the nuclear density analysis method to analyze the spatial distribution of industrial space in Nanjing's central urban area and use GIS software for analysis.Because the KDE takes into account the geographical influence of the first law of geography, it has advantages over other density expression methods (such as sample density, density based on Voronoi diagrams, etc.)

2.3. Circle Analysis
The circle analysis method adopts the graphic fractal technology and centers on the geometric center of a specific analysis object. According to different scales and analysis requirements of the object, concentric circles with outward diffusion are formed with different radii and the same spacing. Circles are formed between adjacent concentric circles. Shi Beixiang uses this method. This method has been applied repeatedly and reached a certain level of consensus. Here, we use this method to conduct research.

Based on the actual conditions of the development and development of the central area, the center point of the Xinjiekou Square, whose starting point was 1978, was selected as the origin. This point is also basically located at the geometric center of the central area at that time. The circle is centered on the origin, and then on the basis of the circle, 3 circles are expanded outward at the same interval.

2.4. Sector analysis
The sector analysis selects the same core point and divides the circle into six large sectors with a sector angle of 60 degrees on the basis of the four-level circle layered by the circle analysis method. The entire range is divided into 24 sector units.

3. Results

3.1. Overall format statistics

According to the survey, the statistical data of retail distribution in the central area of Xinjiekou in Nanjing was obtained. Through the analysis of gis data, the results are shown in Figure 2, Figure 3, and Figure 4; and the analysis of the retail business distribution model was conducted through the circle analysis method and the sector method. As shown in Figure 5, the number of retail commercial operations in the central district of Xinjiekou, Nanjing is divided into four levels, with the number of one-level to four-level decreasing continuously; according to the nuclear density data, the density distribution of Figure 6 is obtained.The sector method is used to compare the density distribution of the number of retail businesses in different locations in the same circle. For example, A1 sector and B2 sector are located in a circle, but the density of A1 sector is greater than that of B2 sector. The density of Fuzimiao area is much higher than that of other areas in the same circle.
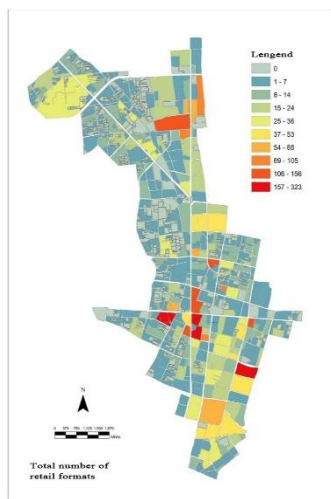

Figure 2 Distribution of Retail Business in Xinjiekou Central District of Nanjing
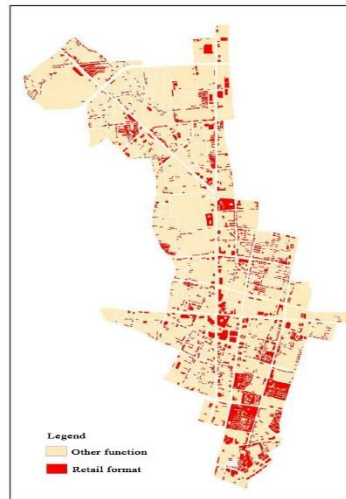

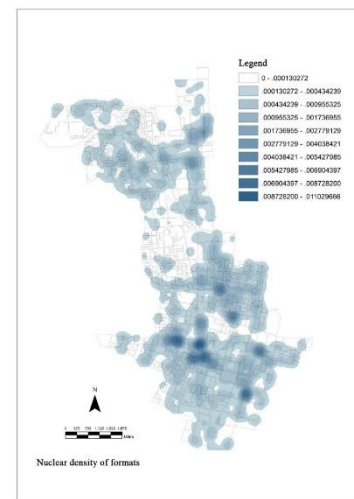Figure 3 Distribution of retail outlets in Xinjiekou Central District, Nanjing

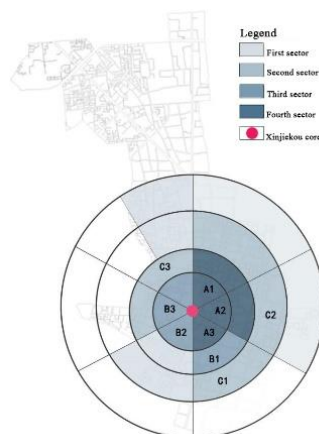Figure 4: Nuclear density map of retail commercial status in Nanjing

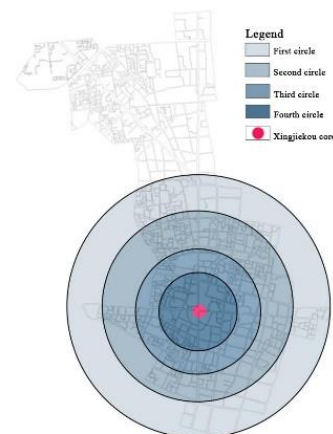Figure 5: Distribution of Retail Sectors in Nanjing

Figure 6 Distribution Pattern of Retail Business in Nanjing

3.2. Spatial statistical results

3.2.1. Axis Development Cluster Type - Central Road Section.

Xinjiekou Commercial Center is located at the intersection of Zhongshan Road, Zhongshan South Road, Hanzhong Road and Zhongshan East Road in the central part of Nanjing City. It is the main commercial center of Nanjing. The Xinjiekou Commercial Center has a strong role in coordinating business in the entire area of Nanjing. Nanjing has established and improved the commercial development structure with Xinjiekou as its core axis.

At this stage, Xinjiekou mainly exhibits the structural characteristics of sheet-like development, and the spatial pattern is mainly high-level. Xinjiekou is the core of Nanjing's commercial development, with high development intensity and high-density office buildings and apartments. According to the quantitative definition method of the central area boundary range proposed above, the space scope of Xinjiekou Commercial Center is defined as: Huaqiao Road and Changjiang Road in the north, Shigu Road and Huaihai Road in the south, and Guanjia Bridge and Wangfu Street in the west; In the east, the quadrilateral area of Hongwu Road is the commercial center of Xinjiekou. As shown in Figure 7, the retail distribution map for the central road segment is shown.

3.2.2. Traffic Convergence Type - Intersection of Zhongshan Road and Hanzhong Road.
The intersection of Zhongshan Road and Hanzhong Road is the main center of Xinjiekou. It is located within the first circle of the central area and radiates from the center to the outer ring. Therefore, the correlation effect of the retail business in this lot is the strongest. With absolute location advantages, this road segment has become a typical representative area of commercial agglomeration. From the retail business distribution map at the intersection of Shanlu Road and Hanzhong Road in Figure 9, we can see that the retail business model of this lot mainly consists of large shopping centers, business centers, and catering. Mainly include Nanjing Mall, Central Mall, Nanjing International Trade Center, Deji Plaza, Friendship Square and other large complexes. Within these large-scale building blocks, the retail business is mainly represented by large supermarkets, high-end and fashion department stores, specialty stores, and urban shopping malls. It can be found that the prices of commodities sold by these format types are much higher than those of community-based retail commercial types; based on the changes in the retail business patterns in the region in recent years, it can be found that the speed of retail commercial renewal in core areas is the fastest of all format types. Therefore, it can be concluded that the spatial distribution and location factors of retail commerce are most relevant. The retail business is in the vertical direction: concentrated in the underground floor to the ground between the four layers, more distributed in the basement of the large-scale complex and the middle and lower floors, the bottom of the business center in the podium. It can be inferred that the distribution pattern of retail business in the vertical direction is closely related to consumer behavior factors.

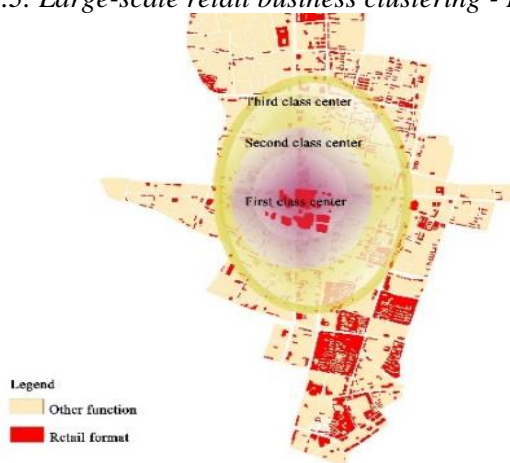*3.2.3. Large-scale retail business clustering - Hunan Road section.*

Figure 7 Retail Distribution of Central Road Lots

Figure 8 Distribution of functional types of central road lots

The Hunan Road section is located in the northwestern part of Nanjing City. It is relatively close to the long-distance bus station and railway station on the north side. The hinterland is vast. Its direct influence area can cover most of the northern part of the Old City and is close to the geographical center of the Old City. On the east side is the scenic Xuanwumen Historic Area. The specific research scope of the historical preservation area of the Yihe Road Residence on the west side is as follows: The business district consisting of Hunan Road, Shanxi Road, Zhongshan North Road (Hongqiao to Yunnan Road Section), Central Road (Majia Street to Wenyunxiang Road Section), and Shiziqiao Pedestrian Street, with a total of 103hm2 in total. From the retail commercial distribution map of Hunan Road in Figure 9, we can see that the retail business distribution features are as follows:

(1) There are various types of retail business, and the agglomeration model mainly shows a linear distribution along the trunk. The types of retail business are mainly professional stores, large-scale shopping malls, supermarket chains, boutique stores, multi-purpose shopping centers, and shopping malls. In terms of space, large-scale commercial facilities are still mainly located at the intersection of the west side, and there are few large commercial networks in the eastern part of Hunan Road. Diversification of scale composition. Hunan Road Commercial Center features small and medium-sized commercial sites as the mainstay, with large-scale commercial service facilities as the growth hotspot. Most of these facilities are distributed along major roads and road intersections. In space, they appear to evolve from the two sides towards the middle. By innovating the traditional retail business model, new forms of business emerged continuously, which promoted the expansion of Hunan Road Business Center. Their distribution in urban space complements and influences each other, and jointly promotes the adjustment of urban spatial structure and the improvement of the commercial center system. Hunan Road Commercial Center features small and medium-sized commercial sites as the mainstay, with large-scale commercial service facilities as the growth hotspot. Most of these facilities are distributed along major roads and road intersections. In space, they appear to evolve from the two sides towards the middle.

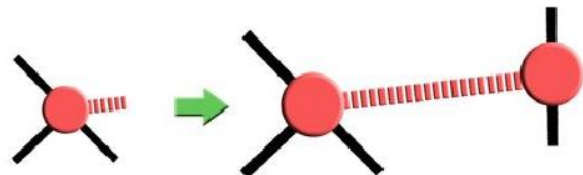Figure 9 Hunan Retail Business Distribution   Figure 10 Schematic diagram of spatial expansion of retail business

(2) The development intensity shows a gradient distribution pattern along the urban arterial road and the two intersections. Since the beginning of the 19th century, a series of high-rise buildings with a height of more than 8 floors have appeared around the major intersections and major traffic routes in the central area, and the number of newly built buildings is mostly between 18 and 50 floors. With this three-dimensional growth, the overall land use development intensity has rapidly increased. It can be seen from the intensity analysis diagram of the commercial facilities construction land of Hunan Road in Figure 11 that there is a significant positive correlation between the construction height and intensity of Hunan Road Commercial Center. In the following two aspects: a. Main roads along streets, intersections and surrounding areas have higher building heights, while other areas are relatively low; b. Development intensity distribution of land also appears around urban roads and intersections at both ends, therefore Form a gradient distribution pattern.

Figure 11 Analysis of Construction Intensity of Commercial Facilities in Hunan Road (Plot Ratio)

3.2.4. Small-scale retail business clustering - Fuzimiao area

The retail business in the Confucius Temple area focuses on the large-scale market, while surrounding small shops such as street shops, department stores, and supermarkets. The area is about 0.5 square kilometers from Pingjiangfu Road in the east to Zhanyuan Road in the west. The number of trade shows is as follows: more than 300 shopping malls, more than 100 recreational facilities, over 300 restaurants, and accommodation facilities. More than 200, in addition to a small number of business offices, residents facilities. The large commercial properties such as the Confucius Temple Grand Market, the Confucius Temple Underground Shopping Center and the Fuzimiao Shopping Mall are concentrated here, and the types of retail business are abundant, and the scale of functions is balanced. Although the Confucius Temple area does not belong to the core circle of the central area of Xinjiekou, Nanjing, and intersects with only a small area of the secondary circle, the distribution characteristics do not conform to the traditional pattern of diminishing circulation distribution. It can be seen that although most of the Confucius Temple lot is located in the third-level circle of the central area, the retail commercial density is much higher than other areas of the same-grade circle, and it has been discovered by studying the regional factors, traffic factors, and historical and cultural factors in the area. This area is more relevant to historical and cultural factors than other regions. The comprehensive government can discuss the business planning, tourism planning and facility planning in the area. The development of retail commerce can use cultural means to enhance the appeal through the shops with historical features. The unique features of the ancient city of Nanjing created in this area have greatly increased the geographical advantages of the area, and the station's setting of the Metro Line 3, the reasonable setting of the pedestrian flow line of the internal commercial street, and the overall human and vehicle branch mode, As a result, the traffic advantage of the area is obvious. Therefore, the high density of retail commerce in the Confucius Temple is a unique representative section of the Xinjiekou Central District in Nanjing, which has important research value.

4. Conclusion

Through the above analysis methods, the retail business of Xinjiekou Central District in Nanjing shows the following distribution characteristics: (1) The distribution density generally decreases from the central ring to the outer ring, and the decrement is increasing. However, spot-like aggregation occurs in some areas, and the average density is much higher than in other areas of the same circle. For example, the Sanshan Street, Laomendong Section of the Fuzimiao District, and the North Zhongshan Road and Intersection. (2) Centralized along both sides of the main trunk line. However, the distribution does not form a continuous straight line, but rather it shows the four corners of the block, and the middle of the road is not equally spaced. The density of branch roads is significantly lower than that of trunk roads, but the distribution of branch roads is higher than that of trunk roads. (3) The retail industry mainly presents a large-area point-like aggregation pattern near the main road, and a linear distribution pattern mainly appears near the secondary road and the branch road.

5. Discussion

Taking the Nanjing urban area as an example, this paper analyzes the spatial distribution patterns of

different industries in the urban area and studies the dynamic mechanism of the spatial expansion of the format from different scales. The main points are as follows: 1. In Nanjing Central District, different business space presents different layout characteristics. Department stores and shopping malls tend to be oriented toward municipal commercial centers and new transportation hubs. They are mainly located near central roads such as Xinjiekou Central Road, Hunan Road and Shanxi Road. 2. The spatial composition among different formats reflects the increasing trend of agglomeration of commercial space. The spatial differentiation of different formats alleviates the problem of unbalanced layout of commercial space, and changes the low commercial distribution density in some regions and the excessive concentration of commercial facilities in the city center. 3. The formation of dynamic mechanisms in different format spaces stems from the combined effects of market behavior, government planning behavior, and residents' shopping behavior. Under the influence of various factors, the future format space will exhibit the following features: functional diversification and thematicization, spatial decentralization and suburbanization, and commercial space structure flattened and multipolarized.

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