

Spatiotemporal Distribution Characteristics and Spatial Formation Mechanisms of China's Fresh Produce New Retail

Xiaoyu Wang¹ & Hongmin Yan²

¹ Tongyuan Design Group, Shandong, Jinan, China

² School of Architecture and Urban Planning, Shandong Jianzhu University, Shandong, Jinan, China

Correspondence: Xiaoyu Wang, Tongyuan Design Group, Shandong, Jinan, China. E-mail: xiaoyuwang.de@gmail.com

Received: November 2, 2024 Accepted: November 27, 2024 Online Published: December 13, 2024

Abstract

As a product of the mobile internet era, the new retail model represents a transformation of traditional and online retail. This emerging force will have a significant impact on the spatial planning and layout of urban commercial facilities and refined new infrastructure in the post-COVID-19 era. Using spatial statistical data and revenue data from 2018 to 2022 on fresh produce new retail outlets in China, along with the ArcGIS analysis platform, this paper studies the spatiotemporal distribution characteristics of fresh produce new retail and its revenues before and during the COVID-19 outbreak in China, aiming to uncover the inherent spatial mechanism logic. The results show: (1) The spatial distribution of China's fresh produce new retail model decreases from east to west and increases from south to north, with a concentration in three major urban agglomerations, particularly the Yangtze River Delta region; (2) Cities with a higher number of fresh produce new retail outlets have developed a mature online consumer market, with convenient transportation conditions and a well-established logistics system; (3) Between 2018 and 2022, the number of fresh produce new retail outlets expanded, and new retail brands increased at the provincial level. Provinces with more outlets have introduced more fresh produce new retail brands; (4) The outbreak of COVID-19 significantly affected the development and profit models of fresh produce new retail. In 2018-2019, the online and offline revenues of fresh produce new retail were nearly equal, but from 2020 to 2022, online business volumes led to a massive surge in revenue, leaving offline sales far behind. Since 2020, offline revenue has almost remained unchanged. The article argues that the spatiotemporal evolution of fresh produce new retail not only reflects the diversification of consumer types and the transformation of demand but also serves as a barometer for the spatial layout of new retail infrastructure. This model represents the establishment of sustainable new consumer relationships, responding to the development of mobile internet and the construction of healthy digital cities. The mobile internet market, big data, smart logistics, flexible fresh supply chain mechanisms, flat distribution models, and intelligent operations all guide spatial planning for urban 5G infrastructure, logistics centers + forward warehouses, long-distance transportation, small street network "capillary" traffic micro-circulation, and the future construction of smart communities. Urban spaces must continuously and sustainably adapt to changes in consumer demand to maintain their competitiveness among global cities.

Keywords: fresh produce new retail, spatiotemporal distribution, new consumption infrastructure, spatial planning and layout

1. Introduction

Since 2013, with the rise of third-party mobile payment platforms such as Alipay and WeChat Pay, China's mobile payment market has experienced explosive growth. According to data from the China Payment and Clearing Association, by 2022, China's mobile payment volume reached 379 trillion yuan, positioning it as a global leader. The upgrade of mobile communication technologies has provided new choices for information dissemination and lifestyle changes. Activities such as entertainment, education, travel, and retail have evolved into new business models in conjunction with the mobile internet. In commercial complexes in developed cities, new retail species such as fresh produce, clothing, and smart home products have emerged. New retail is a typical product of "mobile payment + consumption upgrading," and the Alibaba Research Institute defines "new retail" as a data-driven, pan-retail model centered on consumer experience. Represented by fresh produce, 2016 marked the beginning of fresh produce new retail, with Hema Fresh opening its first physical store in Shanghai, in collaboration with shopping malls. This model, combining dining, retail, and delivery, created a new retail species and reshaped the spatial

forms of urban shopping centers and complexes. In November 2016, the General Office of the State Council issued the "Opinions on Promoting the Innovation and Transformation of Physical Retail," proposing policies to promote cross-industry integration, multi-field collaboration, and the development of online and offline retail integration, encouraging the exploration of fresh produce new retail models. Between 2016 and 2022, fresh produce new retail exhibited rapid spatial diffusion, with 16 fresh produce new retail brands and 406 stores by 2022, growing exponentially over six years and widely distributed across 24 provincial-level administrative regions (<https://www.iimedia.cn/c400/84894.html>).

As an emerging product of the deep integration of physical and online retail, there has been limited research on new retail from a geographical perspective. However, existing literature provides a comprehensive study of the evolution of retail formats and consumer space theory. Research on online retail in spatial geography and behavioral geography is also increasingly robust. Traditional political economics views shopping spaces as locations for transaction activities and product displays, primarily influenced by commercial activities. After entering the consumer society, commercial spaces transformed into consumer spaces and socio-cultural spaces, with people shifting from focusing on the practicality of goods to emphasizing their spiritual significance. Symbolic consumption culture has emerged as a result. Consumption spaces have also shifted from economic exchange venues to public communication spaces, affecting daily life spaces on a spiritual and conscious level. In the information economy, research on online retail focuses on the spatiotemporal evolution and regional relationships of online consumer activities, the interaction between online and traditional consumption spaces, and the impact of information technology on consumption behaviors and commercial spaces. As we enter the mobile internet era, there is a need to address the geographical space research gap regarding new business models. Therefore, this study focuses on the earliest and most rapidly spreading new retail model of fresh produce, using spatial data from fresh produce new retail stores from 2017 to 2022 as a sample to explore the spatiotemporal distribution characteristics and formation mechanisms of China's fresh produce new retail on a macro level.

1.1 Methodology

1.1.1 Nearest Neighbor Analysis

The Nearest Neighbor Index (R) is used to quantitatively evaluate the spatial concentration of fresh produce new retail stores across the country. When $R = 1$, it indicates a random distribution of fresh produce new retail businesses; $R < 1$ indicates a spatial clustering pattern; and $R > 1$ suggests a spatially uniform pattern. The model is as follows:

$$R = d_0/d_r \quad (1)$$

$$d_r = \frac{1}{2} \sqrt{\frac{A}{n}} + \left(0.0541 + \frac{0.041}{\sqrt{n}} \right) \frac{P}{n} \quad (2)$$

In this model, A and p represent the area and perimeter of the study area, respectively; n is the number of spatial points; d_0 is the mean nearest neighbor distance between spatial points; and d_r is the nearest neighbor distance between spatial points in the random distribution model.

1.1.2 Kernel Density Analysis

This method estimates the clustering characteristics of spatial points within a region using a search zone. The kernel density is maximum at the point nearest to the center of the search zone, and decreases as the distance from the center increases. When the distance from the center point x_i exceeds a threshold, the kernel density is 0. The density of a point x is estimated by integrating the sum of search zones, and the density of all spatial points in the area is calculated by moving the search zone and adding values for points at the same location. The kernel density model is as follows:

$$f(x) = \frac{1}{nh} \sum_{i=1}^n K\left(\frac{x-x_i}{h}\right)$$

In this model, $K\left(\frac{x-x_i}{h}\right)$ represents the kernel function; h is the search radius; $x - x_i$ denotes the distance between the estimated point x and the center point x_i ; and n is the number of spatial points within the search area.

1.2 Data Sources

According to the "2022 China Retail New Species Research Report," the fresh food category in the new retail industry, represented by Hema Fresh, is the first sample, followed by 7fresh, Super Species, and later brands such as Su Fresh, Little Elephant Fresh, Fresh Food Drama, LePin Fresh, and other Hema-like fresh new retail entities,

as well as Hema's compact, dine-in-free version, Hema XiaoMa. Since there is no official public statistical data available for the fresh new retail industry, open data has been used as the primary data source for this research. The study collected information on 413 fresh new retail stores from the Dianping website (data as of December 2022), and then spatially vectorized this data by year on a map of China to create a fresh new retail data map for spatial data analysis. The map of China was sourced from the China Mapping Society's Standard Map Service website. In 2016, the first fresh new retail entity, Hema Fresh, was launched, with only 5 physical stores, so the aggregation effect was not significant. Therefore, the study period for analyzing the temporal and spatial evolution characteristics was chosen as 2017-2022.

2. Spatial Distribution Characteristics of Fresh New Retail Formats

2.1 Provincial-Level Spatial Distribution Characteristics

As of December 2022, the spatial distribution of fresh new retail formats in China generally demonstrates an imbalanced pattern, with a decreasing trend from east to west and a higher concentration in the south compared to the north. Analyzing the eastern, central, and western regions, the number of fresh new retail stores shows a "sandwich" distribution: the eastern coastal areas and western inland regions surround the central region. The proportion of fresh new retail offline stores in the eastern, central, and western regions are 75.8%, 10.3%, and 13.9%, respectively. In economically developed eastern regions such as Beijing, Shanghai, Jiangsu, Guangdong, and Zhejiang, the number of fresh new retail stores exceeds 20 per province. In the central and western regions, provinces like Sichuan, Shaanxi, and Hubei also have more than 15 fresh new retail stores.

Analyzing the north-south distribution, using the "Qinling-Huaihe" line as a boundary, the southern region has more stores than the northern region, with the ratio of fresh new retail stores in the south to the north being 72.2% and 27.8%, respectively. Among the provincial-level administrative regions with more than 40 stores, only Beijing, located in the northern region, exceeds this threshold. Due to the active business environment, well-developed internet economy, and mature logistics systems in the southern region, compared to the relatively weaker northern region, the fresh new retail industry has developed more rapidly in the south as a product of the consumer society and mobile payment.

From the perspective of the three major urban agglomerations, as shown in Figure 1 and Figure 4a, fresh new retail formats are primarily concentrated in economically developed regions such as the "Yangtze River Delta," "Pearl River Delta," and "Beijing-Tianjin-Hebei." This aligns with high per capita consumption value aggregation areas. Among them, the Yangtze River Delta region has the largest concentration, with 105 fresh new retail stores, accounting for 36.0% of the total, showing the most significant aggregation characteristics.

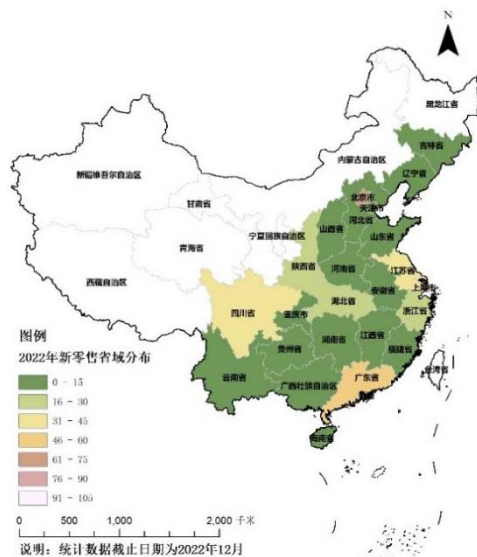


Figure 1. Space Distribution of New Retail in China at Provincial Scale



Figure 2. Space Distribution of New Retail Brands in China

2.2 Urban Scale Spatial Distribution Characteristics

Using the ArcGIS average nearest neighbor tool, the nearest neighbor index for fresh new retail stores nationwide is found to be $R=0.242$, with a p-value of 0, indicating that fresh new retail stores are spatially clustered across the country. As shown in Figure 2, fresh new retail stores exhibit a clear clustering pattern within urban areas, consistent with the "core-periphery" feature of commercial complexes in urban spatial layouts.

From a distribution quantity analysis, Beijing has the highest number of fresh new retail stores, with 43 stores. Shanghai, as the city that first implemented fresh new retail reforms, currently has 42 fresh new retail stores. The third is Shenzhen with 23 stores, followed by Chengdu, known as the "Food Capital" with a relaxed living atmosphere, which has 20 stores, ranking fourth. Wuhan has 16 stores, and Guangzhou, Hangzhou, Nanjing, and Xi'an each have 15 stores. Chongqing has 14 stores, and the remaining cities have no more than 10 stores. The cities with a relatively high number of fresh new retail stores all have developed internet consumer markets, convenient transportation, and mature logistics systems, which provide the necessary infrastructure for mobile payments and cold chain logistics required by the fresh new retail industry.

2.3 Kernel Density Spatial Characteristics

2.3.1 Overall Kernel Density Spatial Characteristics

As shown in Figure 3a, the primary aggregation areas for fresh new retail stores nationwide are located in the three major city clusters. Cities with a kernel density of 8-13 stores per square kilometer are concentrated in Shanghai and its neighboring areas, such as Suzhou, Wuxi, and Nantong. Cities with a kernel density of 5-8 stores per square kilometer are concentrated in Beijing and its nearby cities like Tianjin and Langfang, as well as in the Yangtze River Delta (YRD) region in cities like Hangzhou, Nanjing, Ningbo, Wuxi, Changzhou, and Taizhou, and in the Pearl River Delta (PRD) region including Shenzhen, Guangzhou, and Foshan. In contrast, other cities have a kernel density of less than 5 stores per square kilometer. Cities like Chengdu, Wuhan, and Xi'an, although having a relatively high number of fresh new retail stores within their urban areas, show lower kernel density due to fewer stores in surrounding cities, leading to an "island effect." Additionally, in Chongqing, the large area of the city further dilutes its kernel density value.

2.3.2 Kernel Density Spatial Characteristics of Different Fresh New Retail Brands

Based on the kernel density analysis of spatial distribution for various fresh new retail brands (Figure 3b-d), the Yangtze River Delta (YRD) region is a concentrated site for all types of fresh new retail brands. The highest number of stores is from Hema Fresh, with 156 stores nationwide, having the widest distribution and the largest number of kernel density hotspots, with the highest density being 4-7 stores per square kilometer, located in Shanghai and surrounding areas. Next, regions with a kernel density of 2-4 stores per square kilometer are found in the Yangtze River Delta, Pearl River Delta, the Beijing-Tianjin-Hebei urban cluster, and the Wuhan metropolitan area. Hema Fresh mainly focuses on coastal, economically developed cities, as well as inland cities with developed internet economies and high mobile payment adoption, such as Chengdu, Xi'an, Wuhan, and Guizhou. Hema XiaoMa, a smaller version of Hema Fresh, primarily targets the eastern coastal cities and has quickly expanded to 17 stores. Super Species, with only half the number of stores as Hema Fresh, mainly focuses on southern cities, with slightly higher kernel density areas in the Yangtze River Delta, Pearl River Delta, Chengdu-Chongqing urban area, and the Fuzhou metropolitan area. Other brands, such as 7fresh, which has fewer than 20 stores, have a relatively dispersed layout. 7fresh mainly focuses on northern cities, while Xianshi Yuanyi focuses on cities in the central and western regions, and Xiaoxiang Fresh focuses on secondary cities in the Yangtze River Delta, such as Wuxi and Changzhou. These brands have differentiated layouts compared to the two giants, Hema Fresh and Super Species. The clustering layout of various retail brands in different regions suggests that policy guidance has played an initial role in promoting the orderly development of the fresh new retail industry.

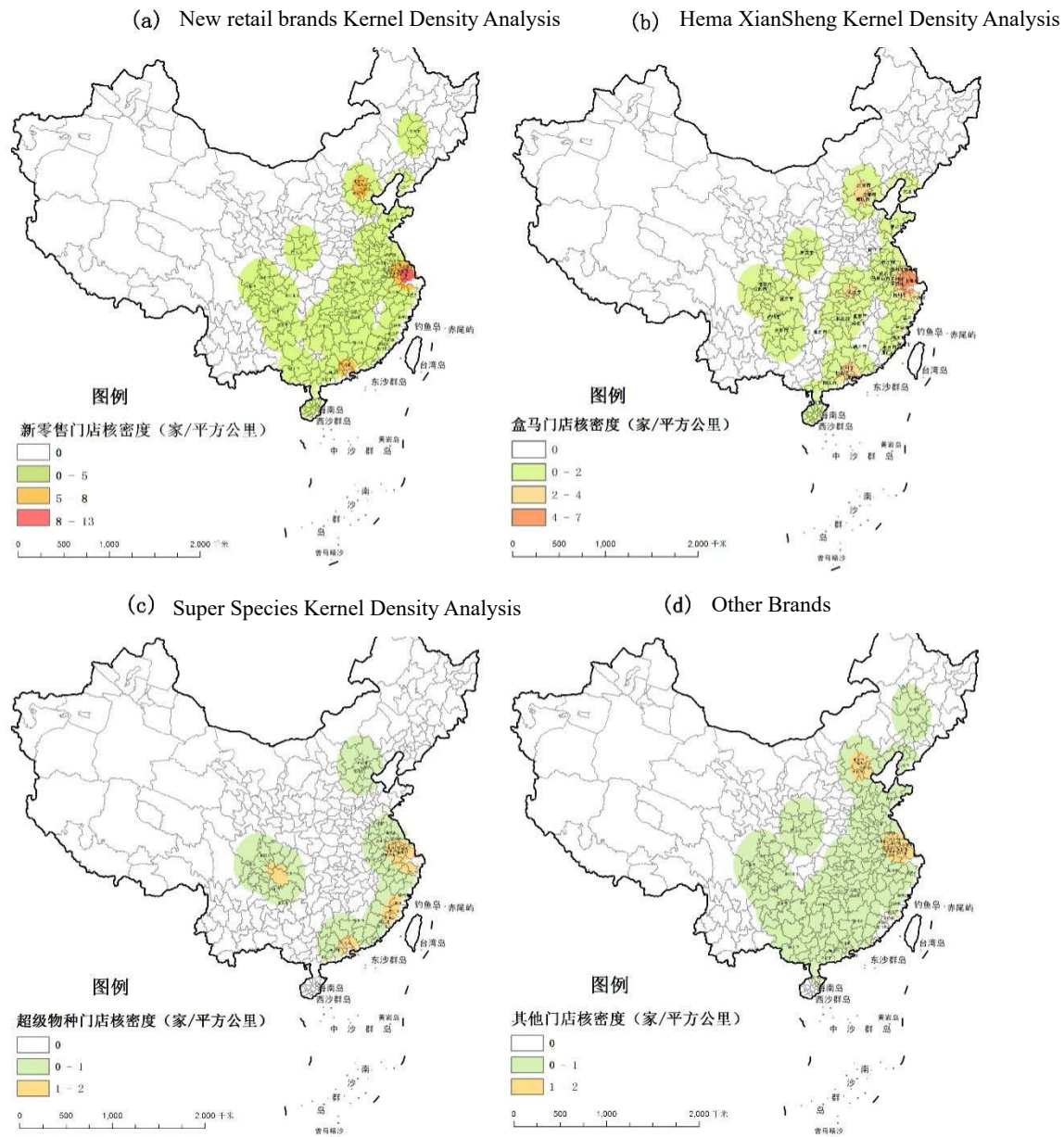


Figure 3. Density of Space Distribution of China's New Retail Stores (Store Number per Square kilometers)

3. Temporal and Spatial Evolution Characteristics of Fresh New Retail Industry

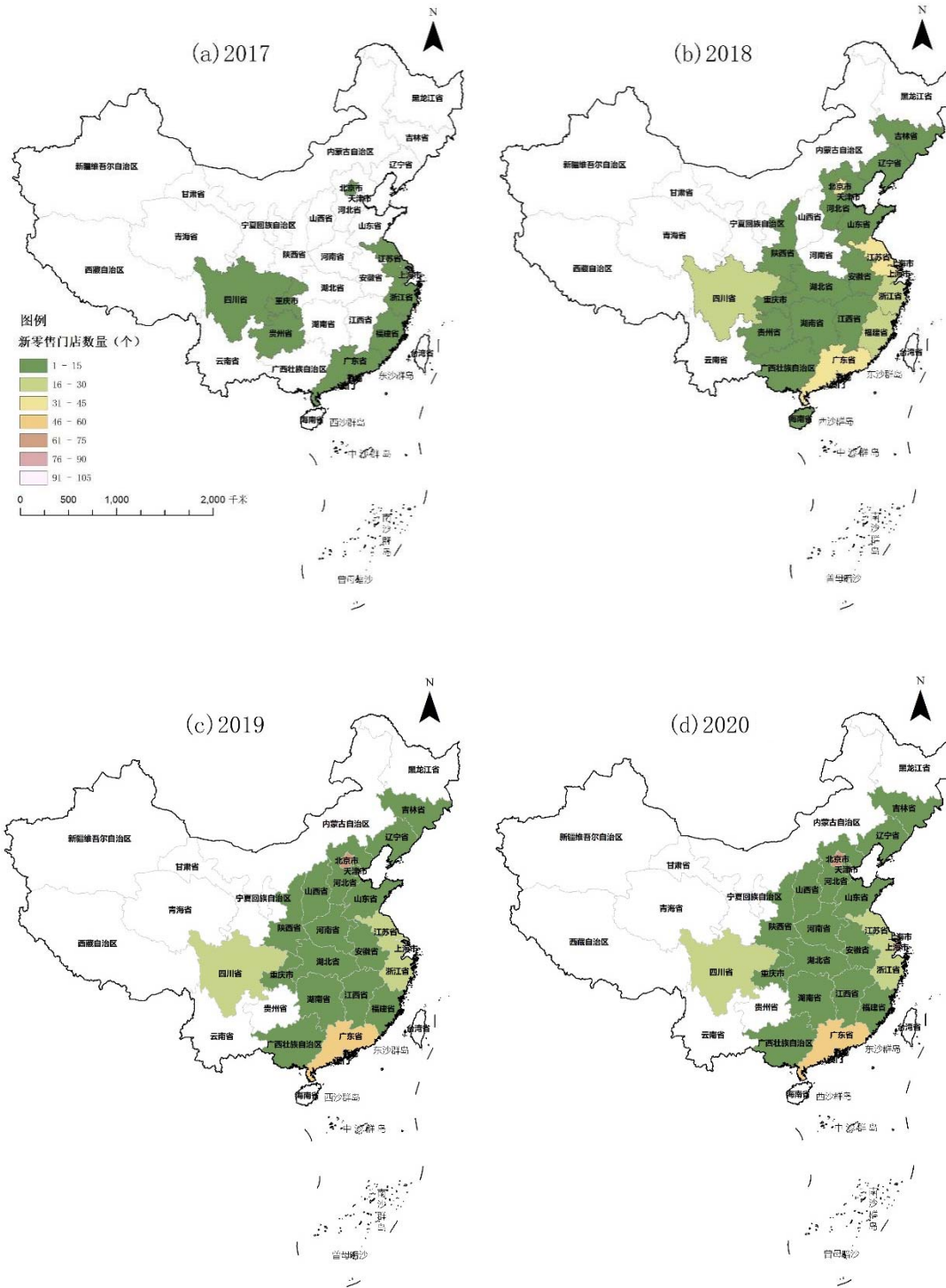
As shown in Table 1 and Figure 4, from 2017 to 2022, the geographic scope of fresh new retail expanded continuously, and the number of fresh new retail brands also increased. In 2017, the number of fresh new retail stores nationwide grew to 40, with 16 stores in Shanghai, accounting for 40% of the total fresh new retail stores in China. Beijing followed closely, adding 6 stores, with a share of 15%. That year, coastal provinces such as Guangdong, Zhejiang, Fujian, and Jiangsu began to roll out fresh new retail models, while western regions such as Sichuan, Chongqing, and Guizhou introduced the new retail concept ahead of central regions. Excluding Shanghai and Beijing, other provincial administrative regions had fewer than 5 fresh new retail stores. In 2017, the fresh new retail brands were dominated by Hema Fresh, Super Species, and 7fresh, with Hema Fresh leading by opening 17 offline stores in economically developed coastal and inland cities with high internet economies, such as Beijing, Zhejiang, Shanghai, Guangdong, and Guizhou. Super Species quickly expanded with 15 stores in Jiangsu, Fujian, Guangdong, Zhejiang, Chongqing, and Sichuan, competing with Hema Fresh. 7fresh expanded more slowly, initially focusing on Beijing with 3 stores.

As shown in Figure 4, by 2022, the total number of fresh new retail stores nationwide reached 406. In the eastern region, provinces such as Shandong, Liaoning, Hebei, Tianjin, Hainan, and Guangxi also began to adopt the fresh new retail model. The four top-ranking provinces (Shanghai, Beijing, Guangdong, and Jiangsu) had more than 40 stores each, with Zhejiang also exceeding 20 stores. In the central region, fresh new retail spread to five provinces: Hubei, Hunan, Jiangxi, Anhui, and Jilin, with Hubei leading with 22 stores. In the western region, the fresh new retail footprint expanded to Shaanxi, with Sichuan rapidly increasing its number of stores to 32. Additionally, fresh new retail brands focusing on fresh supermarket models continued to emerge, totaling 16 brands. Guangdong, Shanghai, and Jiangsu, which have the largest number of stores, also introduced the most fresh new retail brands, with up to 7 brands. In contrast, the central region only saw 1-2 fresh new retail brands, and the western region had 2-3 brands. Among the fresh new retail brands, Super Species stores typically have an area of only a few hundred square meters, with lower initial investment compared to Hema Fresh, whose average store size is 4000 square meters. Therefore, Super Species' expansion speed is second only to Hema Fresh, while other brands have expanded more slowly. Newly introduced brands like Su Xiansheng primarily target Jiangsu and Guangdong, Xianshi Yuanyi focuses on the less developed central and western regions, and Xiaoxiang Fresh mainly focuses on coastal provinces.

Notably, the western region, led by Sichuan, Chongqing, Shaanxi, and Guizhou, outperformed the central region in terms of store numbers, brand types, and introduction times. This is closely related to the rapid rise of inland provinces in the recent "talent competition" and the development of the internet economy. Sichuan and Chongqing's unique food culture traditions, as well as Guizhou's rapid development of the big data industry, have been crucial factors in prioritizing the upgrade of the fresh new retail industry.

Table 1. Quantity Change of New Retail Stores in China (2017-2018)

SUBREGIONS	PROVINCE	2017	2018	2019	2020	2021	2022	BRAND NAMES
EASTERN REGION	Guangdong	4	39	55	46	46	59	Hema Xiansheng, Super Species, 7fresh, Hema XiaoMa, Su Xiansheng, CASA MIA, Everything Market
	Shanghai	16	35	93	84	84	74	Hema Xiansheng, Super Species, Hema XiaoMa, Little Elephant Fresh, Earth Port, Le Marche, Eating & Drinking Institute
	Jiangsu	3	34	25	25	24	44	Hema Xiansheng, Super Species, Hema XiaoMa, Little Elephant Fresh, Su Xiansheng, Youbaoli, Dongshi Xishi
	Beijing	6	31	62	65	81	71	Hema Xiansheng, Super Species, 7fresh
	Zhejiang	4	21	25	25	25	28	Hema Xiansheng, Super Species, Hema XiaoMa, Youbaoli
	Fujian	4	18	4	2	2	6	Hema Xiansheng, Super Species
	Shandong	0	3	10	10	14	10	Hema Xiansheng, Little Elephant Fresh
	Liaoning	0	3	9	8	9	6	Little Elephant Fresh
	Hebei	0	1	8	8	0	2	7fresh
	Tianjin	0	1	8	8	0	5	7fresh
MID-REGION	Hainan	0	1	2	3	3	3	Hema Xiansheng
	Guangxi	0	1	0	0	0	0	Xianshi Yanyi
	Hubei	0	15	6	9	13	22	Hema Xiansheng, Jixian Workshop
	Hunan	0	8	8	8	8	9	Hema Xiansheng, Xianshi Yanyi
	Jiangxi	0	3	3	4	7	7	Xianshi Yanyi
WESTERN REGION	Anhui	0	1	1	1	1	2	Hema XiaoMa
	Jilin	0	1	1	1	1	2	Hema XiaoMa
	Sichuan	2	20	17	18	18	32	Hema Xiansheng, Super Species, Xianshi Yanyi
	Chongqing	1	12	7	7	7	7	Hema Xiansheng, Super Species
TOTAL	Shaanxi	0	12	7	7	6	17	Hema Xiansheng, 7fresh, Su Xiansheng
	Guizhou	1	6	0	0	0	0	Hema Xiansheng, Le Pin Xianhuo
		21	40	266	351	339	406	



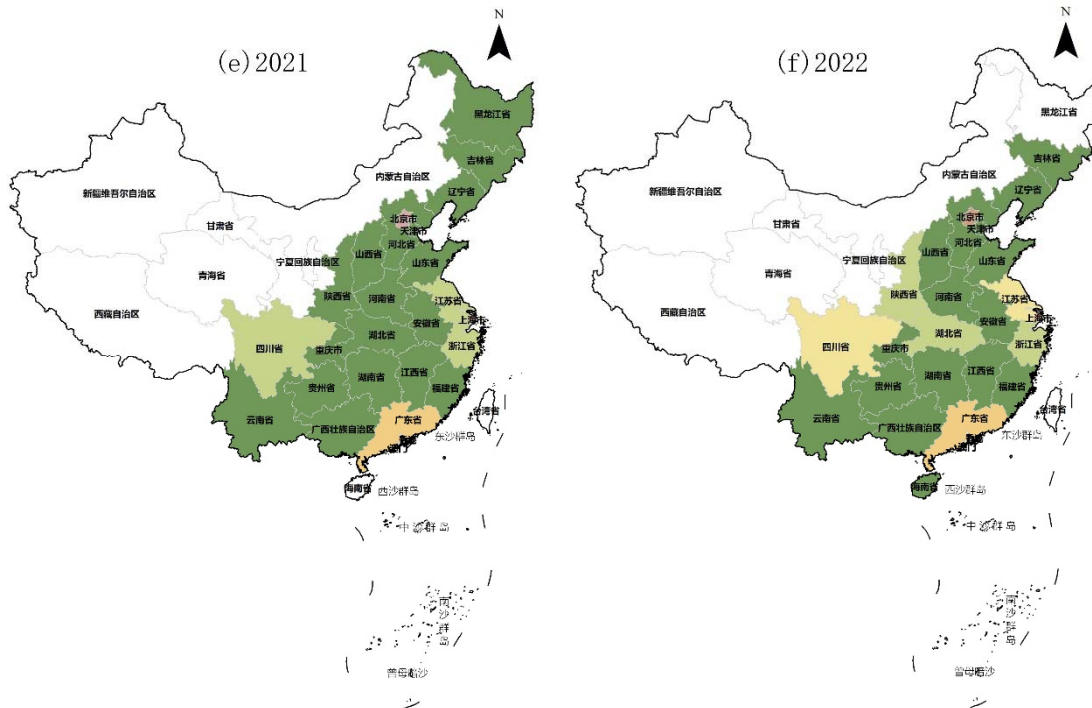


Figure 4. Distribution of China's New Retail Industry at Provincial Scale (2017-2018)

4. Fresh New Retail Industry: Driving Factors and Formation Mechanism

4.1 Driving Factors of the Fresh New Retail Industry

The driving factors of the fresh new retail transformation include the development of 5G mobile internet technology, digital economy, and smart logistics infrastructure, the formation of new consumer habits, the layered development of consumer demand, and policy support for the industry.

- 1) **The Rise and Popularization of 5G Infrastructure and Mobile Internet:**
- 2) The main factor driving the emergence of fresh new retail is the rise of 5G infrastructure and the spread of mobile internet. In recent years, the scale of mobile payment users in China has grown annually. By December 2020, the number of online shopping users reached 782 million, an increase of 72.15 million from March 2020, accounting for 79.1% of internet users, with a year-on-year growth of 10.7%. With the widespread use of mobile payments, mobile internet economy has deeply integrated online and offline retail. This enables consumers to experience and purchase goods in physical stores, effectively bridging the gap between online and offline shopping. Online retail provides traffic and data assets for physical retail, while physical retail offers offline interfaces and space for innovation and transformation. The integration of offline experience stores and online shopping has led to various new retail formats.
- 3) **The Development of Big Data, Smart Logistics, and Related Industries:**
- 4) Big data, intelligent logistics, and other related industries provide technical support for the emergence of fresh new retail. Mobile payments generate consumer data that is identifiable and traceable, enabling customized production based on consumer demands. This innovation influences the spatial structure of urban life and enhances the effectiveness of supply-demand matching through cloud computing and machine learning, which dynamically adjust new business models. The popularization of cold chain logistics technology has made the delivery of fresh goods, flowers, pharmaceuticals, and other specific items more efficient. Cloud computing-supported intelligent logistics and warehouse models are gradually eliminating information bottlenecks in retail supply chains, improving circulation efficiency, and enhancing the immediacy and effectiveness of supply-demand matching.
- 5) **Layered Development of Consumer Demand:**
- 6) The layered development of consumer demand is a necessary condition for the emergence of fresh new

retail. China's consumption society is currently in an incomplete state, undergoing a consumption revolution with a coexistence of personalized, mass, leisure, and status-driven consumption, as well as convenience and novelty consumption. The contradiction between the diversity of consumer demand and the limited physical space for supply drives the stratification of consumption and entertainment social spaces. At the same time, the fusion of consumer categories, service experiences, leisure culture, and life scenarios in both geographical and digital spaces provides conditions for the emergence of fresh new retail formats.

7) **Government Policies Supporting Retail Transformation and Innovation:**

- 8) The government has played a role in promoting retail transformation and optimizing the business environment. The "Opinions on Promoting the Innovation and Transformation of Physical Retail" emphasizes the advantages of e-commerce in digital technology and smart logistics systems, promoting the integration of online and offline retail, and the collaborative construction of a new retail pattern. Administrative approvals are simplified, and financial support for new business formats is increased. Financial regulatory agencies have implemented policies to encourage innovation while preventing risks. A relatively relaxed regulatory environment for mobile payments has also supported the boom in mobile payment markets and the transformation of retail formats.

4.2 Formation Mechanism of Fresh New Retail Industry

Fresh new retail seeks to break the boundaries between physical and online retail by integrating various consumer and leisure scenarios. The formation mechanism of fresh new retail can be categorized into flexible supply mechanisms, flat delivery mechanisms, and intelligent operation mechanisms.

1) **Flexible Supply Mechanism:**

- 2) This mechanism involves building a flexible production supply chain driven by consumer demand. To meet the requirements of convenience and immediacy, a fast and effective consumer feedback system is established. Consumers are involved in the production process through bidirectional interaction of information and resources. For example, Hema Xiansheng offers differentiated imported goods, packaged vegetables, semi-prepared ingredients, and processed seafood, based on different consumer demands and sales channels. Through data-driven category planning and differentiated pricing via the Hema Xiansheng app, the company achieves flexible supply chain management and reduces production costs.

3) **Flat Delivery Mechanism:**

- 4) This mechanism involves building a flat, networked intelligent sub-warehouse system. The logistics distribution network of fresh new retail considers the characteristics of different product categories, intelligently matches product circulation and warehousing scales, and simplifies circulation links. The shared warehouse model proposed by Hema Xiansheng integrates online and offline retail with physical stores acting as experience entry points and delivery centers. It creates an intelligent sorting and automated logistics system, enabling self-operated delivery teams to provide services within a 3 km radius. The use of pre-positioned warehouses and data-driven route planning improves logistics efficiency and reduces circulation costs.

5) **Intelligent Operation Mechanism:**

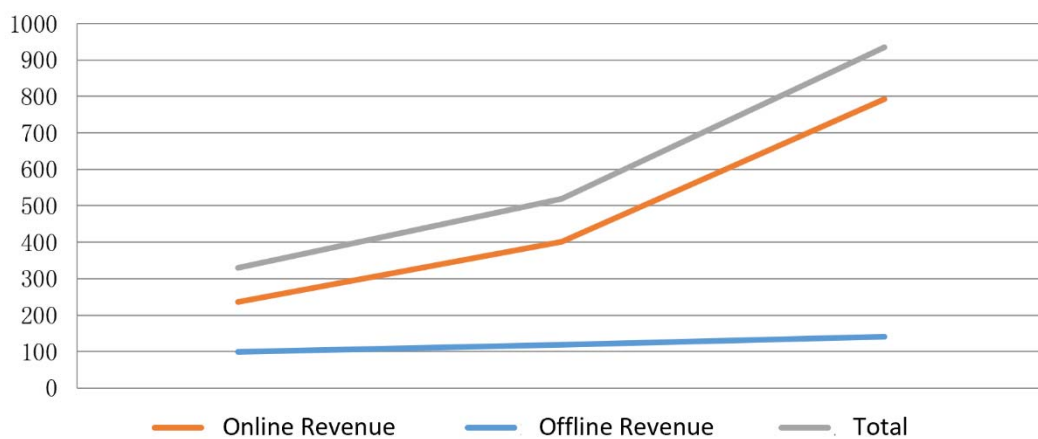
- 6) This mechanism involves data-driven decision-making and business model innovation. Through big data positioning and associative sales, the retail system can extend consumer services and integrate life scenarios. This improves product quality and sensory experience, enhances repurchase rates, and drives sustainable operations. For example, Hema Xiansheng analyzes Alipay user data to identify high-penetration areas for setting up stores, thus reducing operating costs. Its offline stores integrate live seafood processing, cooking, and dining services, innovating around life scenarios. Self-checkout systems using Alipay also generate user consumption data, which informs supply chain adjustments for refined management.

In summary, optimizing and integrating various segments of the retail industry chain can reduce transaction costs, enhance product circulation efficiency, and upgrade consumer demand. This fosters the fusion of online and offline retail, forming a new retail landscape and resolving the conflict between diverse consumption needs and spatial supply.

4.3 Impact of COVID-19 on the Development of Fresh New Retail Industry

To further understand the impact of the pandemic on the fresh new retail industry, a comparison of the online and offline revenue of Hema Xiansheng (a representative brand) from 2019 to 2021 shows that prior to the outbreak of COVID-19, in 2018-2019, the online and offline revenues were almost at the same level. However, between 2020 and 2022, online revenue surged dramatically, with a significant gap compared to offline revenue, which remained almost unchanged since 2020. The pandemic accelerated industry consolidation, with leading companies gaining a larger market share. The external environment for the fresh new retail industry has changed, and both large and small companies have faced industry consolidation. Fresh new retail brands have further consolidated, with Hema Xiansheng being the most notable example, followed by 7fresh. After the pandemic entered a regular control phase, retail companies have increasingly focused on online retail, community-based, and fragmented models. However, fresh new retail companies face greater challenges in improving revenue and controlling costs. Overall, fresh e-commerce saw a surge, and supply chain capabilities need to be enhanced. The pandemic led to a shift from offline to online consumers, with fresh e-commerce, especially those offering timely delivery and home service, seeing a massive increase in orders. Post-pandemic, fresh new retail companies have become more cautious and sensitive in investment decisions.

Revenue (in billions) for Hema Xiansheng from 2019 to 2022



5. Conclusion and Discussion

5.1 Conclusion

This study, utilizing spatial statistical data of fresh food new retail stores from 2017 to 2022, through nearest neighbor analysis and kernel density analysis, explores the spatial distribution characteristics, spatiotemporal evolution features, and formation mechanisms of fresh food new retail formats. The main conclusions are:

- 1) **Spatial Distribution Characteristics:** The fresh food new retail sector in China shows an imbalanced spatial distribution, with a general decline from east to west and more stores in the south compared to the north. The major concentration of stores is in the three main urban agglomerations, with the Yangtze River Delta being the focal area for site selection. Cities with a larger number of stores tend to have well-developed e-commerce markets, convenient transportation, and mature logistics systems.
- 2) **Expansion of Fresh Food New Retail:** From 2017 to 2022, the spatial coverage of fresh food new retail has expanded continuously, and the number of brands has increased accordingly. Provinces with more stores tend to attract a larger number of brands. Among these, Hema Xiansheng (盒马鲜生) and Super Species (超级物种) showed the fastest spatial expansion. The western region, led by Sichuan, Chongqing, Shaanxi, and Guizhou, has outperformed the central region in terms of store numbers, brand variety, and expansion speed due to the recent performance of emerging industries like the internet.
- 3) **Driving Factors and Formation Mechanism:** The driving factors for the growth of the fresh food new retail sector include the rise of mobile internet markets, the development of big data and smart logistics, the diversification of consumer demand, and policy support for retail transformation. Corresponding to

various links in the retail chain, the formation mechanisms of fresh food new retail include flexible supply mechanisms, flat distribution mechanisms, and intelligent operational mechanisms. These are driven by consumer demand and innovative combinations with other life scenarios, sharing online and offline data resources, and creating a flexible production system, automated logistics, and intelligent decision-making systems within the fresh food new retail industry chain.

- 4) **Impact of COVID-19:** Before the outbreak of COVID-19, the online and offline revenues of the fresh food new retail sector were nearly at the same level during 2018-2019. However, between 2020 and 2022, online business surged dramatically, significantly outpacing offline business, which showed almost no growth since 2020.

5.2 Discussion

Although the fresh food new retail sector is a relatively new phenomenon, its emergence spans 7 years. However, there is a lack of comprehensive data on the number of stores and spatial distribution, and research on its spatiotemporal evolution is still limited. This study, due to the lack of sufficient literature, used open data on various fresh food new retail formats as a sample, which is subject to significant limitations. With the future development of this sector, more comprehensive statistical data and longer time periods will allow for further research from different scales and perspectives.

References

- Ali Research Institute. (2017). *Fresh food new retail research report* [R]. Beijing: Ali Research Institute.
- Featherstone, M. (2011). Consumer culture and postmodernism. *Postmodern Openings*, 5(1), 38.
- Guan, C., & Cui, G. (2006). Analysis of the location and types of new urban commercial spaces. *Urban Problems*, (9), 12–17.
- Han, G., & Wang, X. (2006). Research on the spatial relationship between retail industries and their derivative entertainment venues abroad. *Human Geography*, 21(4), 13–19.
- Jean Baudrillard. (2014). *The consumer society* (4th ed.). Nanjing: Nanjing University Press.
- Ji, S. (2010). Production and consumption of urban space in the era of consumption. *Urban Planning*, 34(7), 17–22.
- Jiao, Z. (2013). Spatial distribution and spatial correlation of urban consumption in China. *Economic Geography*, 33(7), 41–46.
- Lan, H., & Zhao, J. (2020). Opportunities, challenges, and strategies for the development of fresh new retail under the background of the COVID-19 pandemic. *Southwest Finance*, (07), 3–16.
- Li, Y., & Xia, Y. (2021). Risk identification and evaluation of business model innovation of retail enterprises during the COVID-19 pandemic. *Statistics and Decision*, 37(02), 163–167.
- Shen, J., Zhang, M., & Zhen, F. (2012). Symbolic spaces and the symbolization of spaces: The construction and diffusion of online and physical consumption spaces. *Human Geography*, (1), 29–33.
- Starrs, P. F. (1997). The sacred, the regional, and the digital. *Geographical Review*, 87(2), 193–218. <https://doi.org/10.1111/j.1931-0846.1997.tb00071.x>
- Wang, L., & Wang, X. (2008). Social stratification and the development of urban social space and its relationship with urban entertainment industries. *Human Geography*, (2), 43–48.
- Wang, N. (2001). *Sociology of consumption: An analytical perspective*. Beijing: Social Sciences Academic Press.
- Wu, D. (2001). On the north-south differences in China's economic growth. *Geographical Research*, 20(2), 238–246.
- Wu, Q., Huang, S., & Cui, W. (2013). Development trends of urban consumer space from the perspective of retail format evolution. *Modern Urban Research*, (5), 114–120.
- Xi, G., Zhen, F., & Wang, X. (2014). Influencing factors and spatial characteristics of online consumption by residents in Nanjing city. *Geographical Research*, 33(2), 284–295.
- Yang, X., Zhou, Y., & Yang, X. (2010). Research on consumer behavior and urban life space behavior patterns of residents. *Human Geography*, (2), 50–53.
- Ye, W. (2020). Challenges and countermeasures for the retail industry under the COVID-19 pandemic. *Commerce and Exhibition Economy*, (04), 32–34.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).