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REVISITING CHINA'S
SUPERMARKET
REVOLUTION:
EVIDENCE FROM
NANJING CITY

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Abstract

Like many emerging economies in the Global South, China is experiencing major transformations of its national and local food system characterized by the rise of supermarkets. There has been an ongoing debate on the relationship between the supermarket and the wet market in developing countries. Drawing on data from a city-wide supermarket mapping and surveys conducted in Nanjing in 2019, this paper revisits China's "supermarketization" process and challenges the prediction of supermarket domination. It reveals that Nanjing's food retailing system has been shaped by the complementarity and co-evolution of the wet market and the supermarket with great policy support. It is necessary for policymakers to recognize the possibility of the coevolution of the supermarket and the wet market in other cities of the Global South. This paper underscores the importance of understanding the complex role of the food system in food security.

Keywords

food security, supermarketization, wet market, food system

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Introduction

The expansion of supermarkets has cast doubt on the continued viability of traditional food markets in many countries and regions in the Global South (Crush and Frayne 2011, Nickanor et al 2019, Reardon et al 2003, Schipmann and Qaim 2011, Suryadama et al 2010, Torres Salcido et al 2015). According to Reardon and others, this transformation came down to a “supermarket revolution” or “supermarketization” which involved progressively greater control over the urban food supply and marketing by supermarket chains (Reardon and Timmer 2003, 2008, Tschirley et al 2015). The rise of supermarkets in China is seen as the main driving factor in the major transformation and modernization of national and local food provisioning system from the 1990s onwards (Goldman 2000, 2001, Reardon and Gulati 2008). Some have predicted that supermarkets are replacing other retail formats and will be the dominant food retailers in China's urban areas in the near future (Gorton et al 2011, Ortega et al 2015). The supermarket chain is considered to have certain advantages of convenience, quality, safety, and shopping experience over traditional retailers (Boselie et al 2003, Maruyama et al 2016, Uncles 2010).

Researchers have yet to reach a consensus on whether urban food systems in the Global South will inevitably be dominated by supermarkets. Some researchers have argued that supermarkets have the potential to improve food security in developing countries (Reardon and Hopkins 2006), which has motivated urban policymakers to address food insecurity through increasing government support for supermarkets (Battersby 2019). Others conclude that the wet market is still the most important fresh food source in many cities (Bai et al 2008, Banwell et al 2016, Schipmann and Qaim 2011, Suryadarma et al 2010). In China, the wet market and the supermarket are often juxtaposed as comparative representations of Chinese traditional and modern food economies, and the relationship between them is symptomatic of the transformation of the food retailing system (Maruyama et al

2016). The persistence of wet markets is due to the lower prices, freshness and variety of food, as well as personal interaction and proximity for consumers (Zhong et al 2019a, Zhong et al 2018). Wet markets have also been extensively supported by government in China in upgrading their infrastructure and improving the food buying environment. In the case of China, the applicability of the “supermarket revolution” model is therefore debatable.

Considerable attention has been paid to food security issues, especially the policy regulation of wet markets (Zhong et al 2019b). Yet, very few studies have looked at the implications of these policies for the relationship between the wet market and the supermarket, suggesting a need to reflect on potential policy implications in the context of urban China. To address this research gap, this study provides detailed and comprehensive insights on whether the prediction of supermarket domination of supermarket revolution theory holds in China's urban context. The study draws on a survey conducted by the Hungry Cities Partnership (HCP) in 2019 about supermarkets selling fresh produce and their adjacent wet markets in Nanjing, China. The Nanjing case is relevant because of the extensive network of wet markets and supermarkets throughout the city as well as a wide variety of municipal policies targeting the food retailing system.

The contribution of this paper is twofold. First, while most studies have analyzed the major transformation of national or regional-level food retailing system, evidence on the city-level food landscape is rare. HCP's previous Nanjing research was the first to use a city-wide household survey data to investigate the city's food system (Si and Zhong 2018). This study is therefore one of the first evaluations of the relationship between the supermarket and the wet market in urban China based on quantitative survey results. Second, this study investigates the complementarity and co-evolution of the supermarket and the wet market in Nanjing, which contributes to the debates on the existing “supermarket revolution” theory by providing baseline evidence and new perspectives for understanding the food environment in urban China.

The ‘Supermarket Revolution’ Model

“Supermarketization” since the early 1990s has been characterized in the literature as occurring in four “waves” of spatial diffusion (Table 1) (Reardon and Gulatti 2008). Each wave involves the rapid increase of modern retail share in food retailing at the expense of traditional shops and wet markets (Reardon et al 2012). The model describes a growing share of food products sold through supermarkets, driven by a confluence of new urban mass markets, the growth of the urban middle class, urbanization, the liberalization of foreign direct investment, and the profit potential of both large multinational and local supermarket chains (Tschirley et al 2015). The penetration of supermarkets into product markets happens first in processed food products and non-food products, then in semi-processed products like dairy products, and finally in fresh produce such as meats, fish and vegetables. Both the spatial diffusion pattern and the product penetration path in developing countries roughly resembles that which occurred decades earlier in Western Europe and the United States (Reardon and Hopkins 2006). China was supposed to have undergone the revolution during the third wave in the late 1990s and early 2000s (Reardon et al 2007, Reardon and Timmer 2008). Within a country, according to the model, the spatial diffusion of supermarkets also occurs in

waves, from large cities to small cities and even rural areas, and from richer groups to the middle class and the working poor (Reardon et al 2003, 2012).

Compared with Mexico and the United States, researchers found a surprisingly rapid penetration of modern food retail in China (Reardon et al 2012). Although systematic statistics on the displacement or acquisition of other retail stores by supermarket chains were absent in China, it was estimated that by the early 2000s, approximately 30% of the value of urban food retail sales were via supermarkets and total sales were growing by 30-40% annually, compared with the overall national retail sales growth of roughly 10% per year. These estimates constitute the basis of the inference that supermarkets were replacing other retail formats and would be the dominant food retailers in China’s urban areas in the near future (Ortega et al 2015). The supermarket chain is considered to have certain advantages of price, convenience, quality, and safety over traditional retailers. These advantages, in turn, create competition and tensions with traditional retailers and suppliers. An inflection point appears to be when the supermarket share of total food retail is roughly one-third to one-half (Reardon and Hopkins 2006).

China has been viewed as an attractive retail market since it opened its consumer market in the 1990s (Chuang et al 2011, Zhang and Pan 2013). That is

TABLE 1: Four Waves of Modern Food Retail Diffusion in Developing Countries

Waves	Year of occurrence	Share of modern retail in overall food retail	Countries or areas
First	Early-to-mid 1990s	5-20%	Latin America, north-central Europe and the Baltic countries, South Africa, East Asia (outside China and Japan)
	Early-to-mid 2000s	50% or more	
Second	Mid-to-late 1990s	5-10%	Southeast Asia (outside transition countries like Vietnam), Central America, Mexico, south-central Europe
	Early-to-mid 2000s	30-50%	
Third	Late 1990s or early 2000s		“Transition” East Asia (China, Vietnam), India, Russia, parts of eastern and southern Africa, some countries in Central and South America
	Around 2007	5-20%	
Fourth	“The supermarket revolution is just starting in some countries”		Africa outside South Africa, mainly in Eastern/Southern Africa

Source: Adapted from Reardon and Gulatti (2008) and Reardon et al (2012).

also when supermarkets began to grow rapidly in China (Geng et al 2017). The expansion accelerated after China joined the World Trade Organization in December 2001 and foreign investment was granted access to China's consumer market (Hu et al 2004). The number of supermarket stores in China increased from 10,281 in 2002 to 33,024 in 2018 (China Statistical Yearbook 2004: 17-27, 2019: 15-7), with an average annual increase of 8%. Although the rise of supermarkets changed urban China's retail landscape and was considered the main driving factor of transformation in many studies (Goldman 2000, Hu et al 2004), there is still an ongoing debate on whether supermarkets would completely dominate food retailing.

The "supermarketization" model is not only contested in China but has been controversial from the outset. Abrahams (2009), for example, called the model "supermarket revolution myopia" for its neglect of the resilience and competitiveness of informal markets and other local agrifood players. Recent studies have demonstrated the persistence of traditional markets (including wet markets and informal food economies), which results in the competition with supermarkets in many cities of the Global South (Banwell et al 2016, Maruyama and Trung 2012, Nickanor et al 2019). Critics also argued that the spread of supermarkets would not have a uniform impact and the future landscape of food retailing in developing countries would be more varied than the "supermarket revolution" hypothesis predicted. As Humphrey (2007: 433) pointed out, "the extent of the transformation of retailing (in developing countries), and also of food production as a consequence of it, is overestimated, particularly for fresh produce".

In addition, researchers have questioned the implications of supermarket expansion for food security (Wagner et al 2019). Most surveyed households in rapidly-growing African cities experiencing supermarket expansion still experience severe food insecurity (Frayne et al 2018). Although the food was accessible through supermarkets, they were not generally a source of healthy food (Battersby 2019). Informal food retail offered the urban poor more food choices and improved food security (Crush et

al 2019). Supermarkets have also been implicated in the nutrition transition and the rapid expansion of overnutrition, obesity and non-communicable disease in cities of the Global South (Asfaw 2008, Baker and Friel 2016, Demmler et al 2018, Hawkes 2008, Kimenju et al 2015, Umberger et al 2015).

Methodology

This paper is based on a citywide survey of 82 supermarkets and 82 adjacent wet markets in Nanjing in Eastern China, about 300 kilometres from Shanghai. There were about 7 million people in the urban area of Nanjing City in 2018 (Nanjing Statistical Yearbook 2019). Four main sources of data were collected and analyzed. First, as the foundation of fieldwork, an inventory of all branded supermarkets selling fresh produce and wet markets was compiled from BaiduMap via web crawler and verified through field visits, including their names and geospatial data. A total of 170 supermarket stores selling fresh produce owned by 13 brands were identified, as well as 351 wet markets. Second, 90 supermarkets were sampled using stratified random sampling. These were distributed among the city's 11 districts proportional to the numbers of supermarkets in each district. All of the supermarkets in each district were numbered and randomly sampled from the list. Third, the sampled supermarkets were visited to conduct surveys of supermarket managers (one per supermarket) and consumers within the fresh produce area (10-15 per supermarket). Specific information on each supermarket was collected including fresh produce sales items, prices of major fresh products, and infrastructure conditions. To compare supermarkets and wet markets, the study measured the factors involved in the shopping experience using a five-level ordinal scale as follows: (a) for booth uniformity and floor cleanliness, 1 bad, 2 not good, 3 not bad, 4 good, 5 very good; (b) for odour, 1 very strong, 2 strong, 3 not bad, 4 light odour, 5 free of odour; (c) for lighting, 1 poor lighting, 2 less bright, 3 not bad, 4 bright, 5 very bright. The survey was conducted from January to March 2019 by 45 investigators trained and supervised by two of the authors of this

paper. The survey was conducted electronically using the Open Data Kit (ODK) data collection software preinstalled on android tablets. The data collected were then uploaded and synthesized on the online KoBoToolbox database for data cleaning and analysis. Finally, in order to compare supermarkets and wet markets, the closest wet market to each sampled supermarket was visited to collect similar specific information. If the closed wet market was shut down or under reconstruction, an alternative

wet market within 3km was located and visited. In one case, there was no other wet market within that radius.

In the final analysis, 90 supermarkets and 89 wet markets were surveyed, and a total of 996 supermarket consumers and 56 supermarket managers were interviewed. In total, information on 82 pairs of supermarkets and wet markets were collected and analyzed for purposes of comparison (Figure 1).

FIGURE 1: Distribution of Surveyed Supermarkets (left) and Wet Markets (right) in Nanjing

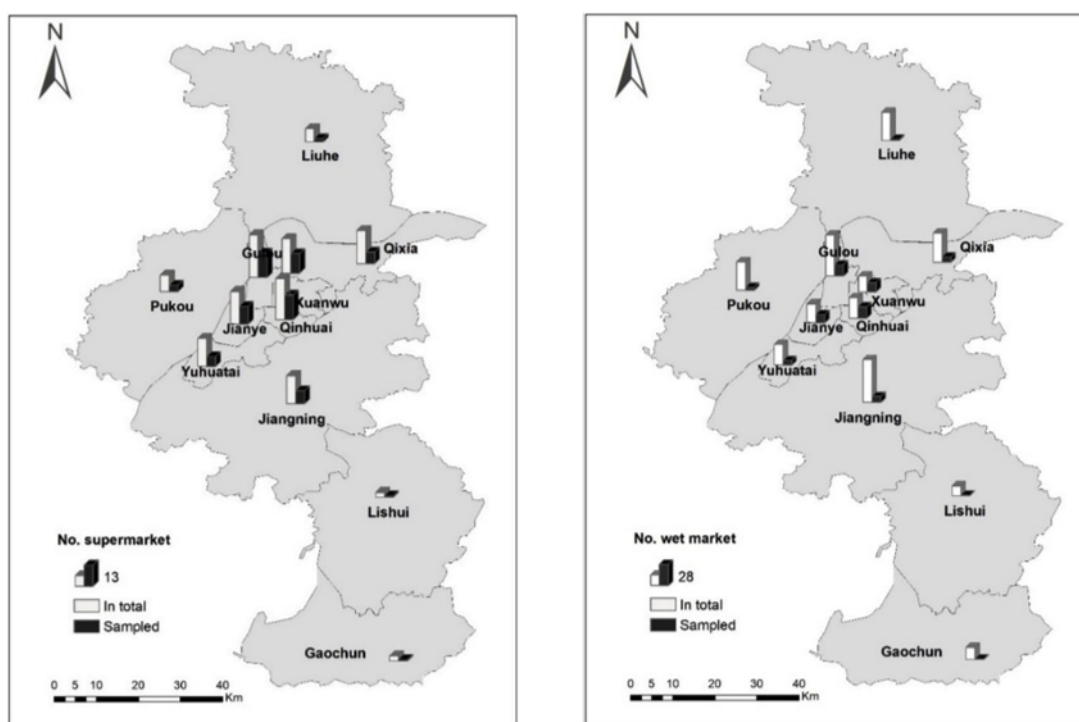


TABLE 2: Distribution of Sampled Supermarkets Across Nanjing

District	Total		Samples with consumer surveys		Samples with manager surveys		Supermarkets with basic information	
	No.	%	No.	%	No.	%	No.	%
Xuanwu	21	12	14	16	10	18	12	15
Qinhuai	25	15	18	20	9	16	15	18
Gulou	26	15	16	18	11	20	15	18
Jianye	20	12	12	13	4	7	11	13
Qixia	20	12	4	4	4	7	7	9
Yuhuatai	17	10	7	8	6	11	6	7
Pukou	10	6	4	4	2	4	4	5
Jiangning	17	10	11	12	6	11	8	10
Liuhe	8	5	2	2	2	4	2	2
Lishui	3	2	1	1	1	2	1	1
Gaochun	3	2	1	1	1	2	1	1
Total	170	100	90	100	56	100	82	100

Complementarity of Supermarkets and Wet Markets

According to previous studies, wet markets and supermarkets are the main food sources for urban household in Nanjing (Si et al 2019). Most are located close to residential communities. Supermarkets are more concentrated spatially and are primarily found in the core urban districts of Xuanwu, Qinhuai, Gulou, Jianye, Qixia (Figure 2, Table 3). According to 2018 statistics, 52% of the population resides these core urban districts where 76% of supermarkets are located. The distribution of wet markets is better aligned with the population distribution than supermarkets. The number of wet markets is more than twice the number of

supermarkets and they can be found in all districts, making them the most important source for daily fresh food purchases (Si and Zhong 2018). A total of 55% of the wet markets are located in the core urban district (Table 3). The concentration of supermarkets in urban districts is therefore higher than for wet markets. This reflects the planning policy of wet markets by the Nanjing Municipal Government that has required the establishment of wet markets for newly-built residential communities since the early 2000s (Zhong et al 2019b). In contrast, profit-driven supermarkets tend to concentrate in urban areas with convenient transportation and denser population. Together, supermarkets and wet markets play a vital role in creating a favourable food environment that ensures a high level of food accessibility for residents in Nanjing (Zhong et al 2018).

FIGURE 2: Spatial Distribution of Supermarkets (left) and Wet Markets (right) in Nanjing

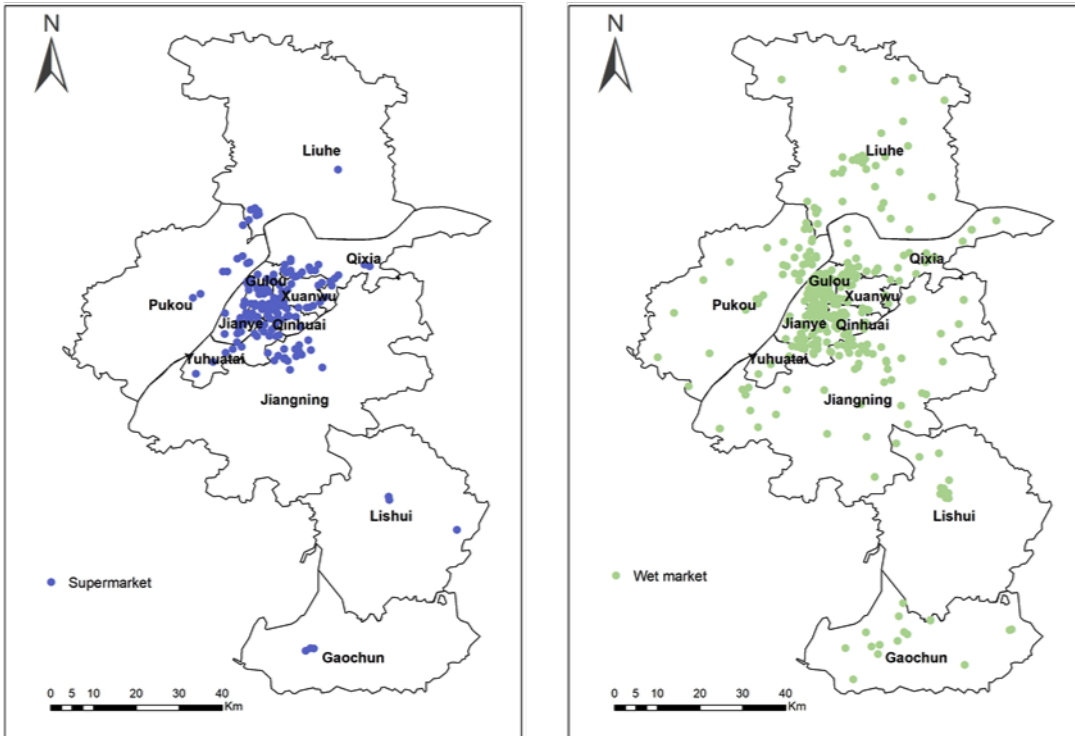


TABLE 3: Wet Markets, Supermarkets and Resident by District

District	Wet market	Supermarket	2018 resident population (million)	Population proportion of each district (%)
Xuanwu	21	21	0.60	7
Qinhuai	27	25	1.00	12
Gulou	54	26	1.11	14
Jianye	25	20	0.49	6
Qixia	38	20	0.73	9
Yuhuatai	27	17	0.46	5
Pukou	37	10	0.84	10
Jiangning	56	17	1.29	15
Liuhe	37	8	1.00	12
Lishui	13	3	0.47	6
Gaochun	16	3	0.45	5
Total	351	170	8.44	100

The HCP Food Purchasing Matrix (HCFPM) uses data from the 2015 household survey in Nanjing and shows clear complementarity between supermarkets and wet markets in terms of which foods tended to be purchased where (Crush and McCordic 2017; Si and Zhong 2018). Table 4 clearly shows that for most products (purchased by at least 20% of households), one or the other source

tended to be predominant. Supermarkets tended to dominate as a source for processed foods and wet markets for fresh foods (with the exception of eggs and milk). Over three-quarters of households patronized wet markets for their vegetables and fresh meat. The only foodstuffs where the market share tended to be divided was eggs, pasta and fresh fruits.

TABLE 4: Sources of Major Food Items in Nanjing

Food	Supermarkets (% of purchasing households)	Wet markets (% of purchasing households)
Snacks	92.0	4.2
Cooking oil	89.0	9.6
Sugar	88.3	7.5
Powdered milk/sour milk	82.3	3.5
White bread	76.3	5.4
Tea/coffee	75.7	4.5
Brown bread	73.2	4.3
Rice	71.7	25.3
Fresh milk	65.3	5.5
Eggs	59.7	55.9
Pasta	58.2	40.9
Fresh fruits	45.9	59.2
Fresh beef	34.1	76.7
Fresh pork	25.6	83.8
Fresh/cooked vegetables	22.1	92.6
Fresh chicken	17.6	92.4
Pies/steamed buns	11.2	34.2
Steamed bread	0.4	32.7

Note: Multiple responses allowed
Source: Si and Zhong (2018: 37)

The survey of 82 supermarkets for this paper concluded that supermarkets sell more processed food items than wet markets, including frozen food, deli, and bread/snacks. These foods are sold in 99%, 95% and 94% of supermarkets respectively, while the proportions for wet markets are 67%, 87% and 46%. All outlets sell both vegetables and fruits. Other food items (such as eggs, fish and aquatic products/sea food as well as bean products) are equally common at both outlets (more than 86% of both). Fresh meat was the only food item that was sold in more wet markets than supermarkets (Figure 3).

The claim is often made that supermarkets offered lower overall costs for consumers because of the one-stop shopping mode provision (das Nair 2018). However, this was not born out in Nanjing with regard to fresh produce. The prices of six common fresh food items per kilogram (kg) were noted and averaged in all outlets sampled. These included bok choy (USD1.5 per kg in supermarkets versus USD1.1 per kg in neighbouring wet markets), tomato (USD1.8 versus USD1.5), live crucian (USD3.5 v USD2.7), plain raw egg (USD2.0 v USD1.5), pork belly (USD6.1 v USD4.3) and beef brisket (USD12.3 v USD11.3). The combined prices of all six food items were 30% more expensive in supermarkets than in wet markets. Contributing factors to the lower prices in wet markets could be lower operating cost due to the subsidies from the government in forms of cheaper electricity

or water rates and lower rent being charged to vendors. It could also be because of the lower degree of consolidation in the wet market system contributing to lower storage and management costs than supermarkets with centralized distribution centers. Other government interventions to balance food affordability and vendor profitability of wet markets also help to reduce the cost (Zhong et al 2019b).

While one-stop shopping experience offered by supermarkets is more convenient and therefore more attractive to consumers, multi-stop shopping or cross-platform shopping for food is common among urban consumers in China (Bai et al 2008). Only 18% of supermarket shoppers surveyed for this study reported they had not also shopped in wet markets during the previous three months. Asked where they preferred to buy particular food items, wet markets were more popular for fresh food like meat, vegetables and fruits, aquatic products/sea food, and bean products. On the other hand, supermarkets were preferred for processed foods including frozen food, bread/snacks, deli and other items like dairy products and imported foods. Eggs appear to be the only item where there seems to be a split market (Figure 4), confirming the finding in the earlier HCP survey (Table 4). From the perspective of the consumer, the supermarket and the wet market therefore play complementary roles in the food retailing system with an overlapping customer base and different foci on food items.

FIGURE 3: Sources of Main Food Items

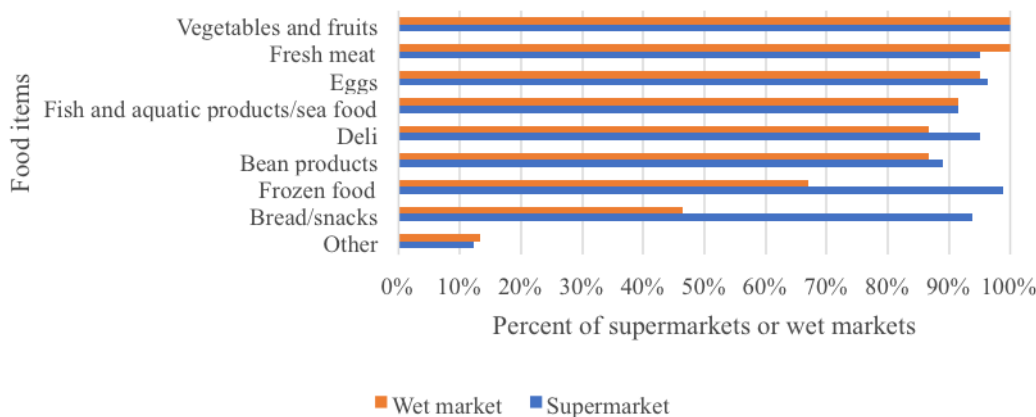
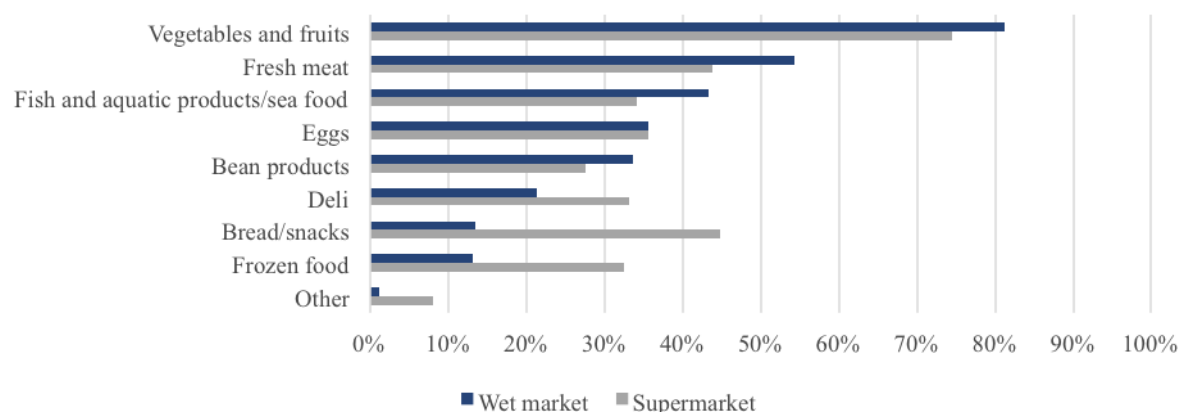


FIGURE 4: Food Purchase Preferences



The supermarket consumer survey also found that 47% of those who were buying fresh produce at supermarkets when surveyed reported that they actually preferred wet markets. A few Nanjing households preferred to purchase fresh produce from supermarkets mainly for the cleaner shopping environment and the convenience of one-stop shopping provided by supermarkets. Some consumers claimed that they did not often shop in the supermarkets but just dropped in to look around. Others were visiting Nanjing. One female consumer said she was getting medical treatment in Nanjing and would normally purchase food in wet markets when she was in her hometown. A few only shopped in the supermarkets because they were given gift cards by their employers as holiday perks. The 2015 HCP household survey found that 75% of respondents visited wet markets at least five days a week, while only 18% visited supermarkets at least five days a week (Si et al 2019). Chinese consumers rely on wet markets to meet their demand for fresh supplies through frequent shopping rather than storing a large quantity of food for a longer time (Goldman 1999, Zhang and Pan 2013).

Supermarket and Wet Market Co-Evolution

The arrival and expansion of the supermarket were considered to provide a major impetus in the modernization of the retail system in China (Dong et al 2006, Chuang et al 2011). To some extent, this

became the basis for the Chinese government's post-2000 drive to modernize agri-food supply and logistic systems and to eliminate perceived inefficiencies of the traditional market system. The government program of "nong gai chao" aimed at converting wet markets into supermarkets in several large cities including Nanjing, Guangzhou and Shenzhen from 2000 to 2004 (Maruyama et al 2016). In 2003, the No.1 Central Document of 2004 issued by the Chinese Central Government encouraged areas where conditions permitted to convert urban farmers markets into supermarkets. It also denoted support for leading agricultural enterprises to open agricultural supermarkets in cities and gradually extend the network to urban communities (Chinese Central Government 2003). Since then there has been a nationwide upsurge of "nong gai chao". This program was seen as evidence that supermarkets were taking place of wet markets in China (Hu et al 2004).

Despite years of effort, the implementation of the program has been painfully slow due to the high cost of conversion as well as consumers' preferences for traditional wet markets rather than modern supermarkets (Maruyama and Wu 2014, Chen et al 2013). About 80% of converted supermarkets suffered massive financial losses and failed to survive in Nanjing (Huang 2005). Under these circumstances, the program of *nong gai chao* evolved into *nong jia chao* in some cities; a policy of integrating supermarkets into wet markets or upgrading the shopping environment of wet markets to parallel

supermarkets. In Nanjing and other cities including Shanghai and Hangzhou, the program emphasizes investing in infrastructure improvement of wet markets in urban districts (Cui 2011).

The Nanjing Municipal Government has launched four rounds of wet market upgrading, funded and subsidized by public funds since 2007. From 2007 to 2014, the municipal and district-level governments of Nanjing invested about CNY156 million (USD23.4 million) to support the upgrading of 293 wet markets. In 2017, the Nanjing Municipal Government planned to upgrade 230 wet markets by 2019, 36 of which received a subsidy of CNY13 million (USD2.1 million) in 2018. Each wet market would get subsidies of USD58.90 to USD73.60 per square metre and 70% of their investment in renovation, with intelligent electronic scales, food traceability systems including standardized food

safety fast-detection room, transaction information screens, central air-conditioning, and WiFi hotspots (Nanjing Bureau of Finance 2018, 2019). These upgrades greatly enhanced the shopping environment of wet markets to meet urban residents' food demands.

Earlier studies argued that supermarkets would inevitably dominate the food retail landscape because they offered consumers an overall shopping experience that includes food safety, food quality and other services in order to build and protect their brand capital (Boselie et al 2003). Others pointed to the consumer preference for patronizing multiple outlets. The consumer survey for this study showed that supermarkets are generally seen as a better shopping environment than wet markets in terms of uniformity, floor cleanliness, odour and lighting (Table 5). For example, over 90% said the

TABLE 5: Distribution of Wet Markets and Supermarkets with Different Degrees of Shopping Environment Evaluation

Shopping environment	Score	Description	Wet markets (%)	Supermarkets (%)
Booth uniformity	5	Very good	19.5	63.4
	4	Good	43.9	28.1
	3	Not bad	23.2	6.1
	2	Not good	11.0	2.4
	1	Bad	2.4	0.0
	Total			100.0
Floor cleanliness	5	Very good	11.0	57.3
	4	Good	31.7	32.9
	3	Not bad	31.7	8.6
	2	Not good	23.2	1.2
	1	Bad	2.4	0.0
	Total			100.0
Odour	5	Free of odour	11.0	53.7
	4	Light	45.1	32.9
	3	Not bad	31.7	11.0
	2	Strong	11.0	2.4
	1	Very strong	1.2	0.0
	Total			100.0
Lighting	5	Very bright	20.7	63.4
	4	Bright	36.6	29.3
	3	Not bad	31.7	6.1
	2	Less bright	9.8	1.2
	1	Poor lighting	1.2	0.0
	Total			100.0

uniformity and cleanliness in supermarkets was good/very good, that they were odour-free/light odour, and that lighting was good/very good. The equivalent percentages for wet markets were 63% (booth uniformity), 43% (floor cleanliness), 56% (odour) and lighting (57%). Only a small minority thought that conditions in both were poor although 26% said floor cleanliness in wet markets was not good/bad. No one rated supermarkets as “bad” in any of the categories. That said, the perceived environment of wet markets was far removed from the stereotype of “dirty, disorderly and bad”, a direct reflection of conditions post-renovation and upgrades. More than three-quarters of the wet markets got a score of 3 or higher, which conforms their fair to middling environment. As the upgrade of wet markets continues to be implemented, it is plausible that the gap between wet markets and supermarkets in terms of the shopping experience would be further narrowed. The change from *nong gai chao* to *nong jia chao* signals the persistence of traditional food outlets and the recognition of this by the government.

Supermarket and Wet Market Supply Chains

In contrast with the multilevel and fragmented nature of traditional food supply chains, supermarket supply chains are considered to be more integrated, efficient and cost-effective involving direct contracts with farmers, and just-in-time direct delivery to and from centralized company-owned distribution centers (Boselie et al 2003). The rise of supermarkets was predicated on a ‘quiet revolution’ in China’s food supply chains in certain respects, including modernizing cold storage facilities, increasing food traceability, commercializing small farmers, and providing cheaper staples (Reardon and Chen 2012).

The survey showed that the procurement and retailing practices of supermarkets’ fresh produce business in Nanjing are similar to that of wet market vendors. The interviews with supermarket

managers indicate that about 70% of stores procure fresh produce in cooperation with suppliers who obtain large volumes of fresh produce from wholesale markets or agents where the volumes have already been aggregated by a large number of traders. This is similar to the procurement practices of wet market vendors who procure either from these suppliers or buy directly from wholesale markets. These procurement suppliers are called second-level wholesale agents, some of which are themselves small and micro enterprises. Only 14% of surveyed supermarket managers said they procured directly from producers. Most supermarkets lack an integrated food supply chain and have been incorporated into the existing supply chains. This finding is consistent with the fresh vegetable supply chains of supermarkets in other Chinese cities (Zhang and Pan 2013).

Another important finding is that the categories of fresh produce sold in supermarkets are very similar to those in wet markets. Supermarkets draw on the experience of wet markets to arrange sectors for freshly cooked deli and pastry, loose rice (besides packaged rice), and live aquatic products that can be freshly killed on demand. A decade ago, these foods were only sold within wet markets. This move was interpreted as a strategy of projecting the image of being like a wet market to attract a broader spectrum of consumers (Reardon and Chen, 2012). According to the policy of “fresh produce zones” in supermarkets issued by the Nanjing Municipal Government (2011), supermarkets are required to reserve 20–30% of their existing area for fresh produce retail. This policy enhances supermarkets’ role in the fresh food provisioning system within the city and could also mitigate the negative impacts of supermarkets on people’s diets, overnutrition, obesity and non-communicable diseases (NCDs) by avoiding oversupply of unhealthy food (Zhong et al 2019b, Baker and Friel 2016, Demmler et al 2018).

Wet markets are considered to have an advantage over other retail formats in fresh food by creating a sense of freshness desired and valued most by consumers (Feng and Li 2008, He et al 2005, Zhong et al 2019a, Zhou et al 2003). Two-thirds

of supermarket managers interviewed believed that their fresh food business was influenced by wet markets, and almost 80% viewed wet markets as competitors. Therefore, the supermarkets' imitation of wet markets in constructing freshness and the shopping environment not only proves the competitive advantage of wet markets in the food retail landscape of urban China but also makes supermarkets "quasi wet markets".

Conclusion

The transformation of the food retailing system has a significant impact on the food security of cities in the Global South. In this context, understanding the relationship between wet markets and supermarkets becomes a fundamental premise for effective food policies to facilitate food security and food system sustainability. This study builds on previous research that points out while food retail shares through supermarkets have increased rapidly, supermarket-oriented food policies have not significantly improved or even compromised the level of food security (Crush et al 2019).

This paper revisits and challenges the existing supermarket revolution model in China's urban context, based on a survey conducted in 2019 on supermarkets selling fresh produce and their adjacent wet markets in Nanjing, China. The survey results show that the supermarket and the wet market play complementary roles in the food retailing system with an overlapping customer base. This complementary relationship is reflected in their different focus on food items. Wet markets are more popular destinations for fresh food like meat, vegetables and fruits, and aquatic products/sea food, while supermarkets have an advantage in processed foods including frozen food, bread/snacks, deli and other items like dairy products and imported foods.

Consistent with other studies this study confirms that people tend to shop for processed food in supermarkets but purchase fresh produce from wet markets, suggesting that wet markets and supermarkets are complementary shopping choices rather

than competing ones for Chinese consumers. More importantly, the supermarket and the wet market have been co-evolving to meet consumers' needs for freshness and a better shopping experience. On the one hand, supermarkets imitate wet markets in fresh produce retailing. On the other hand, the shopping environment in wet markets has been greatly enhanced. Therefore, the initial differences between the supermarket and the wet market have become blurred, although they do not appear to replace one another.

The resilience of wet markets in China is attested in many studies (Cui 2011, Zhong et al 2019a) and verified by this research. Yet, this paper argues that the provision of lower prices and freshness is not the only reason why wet markets persist in the face of the pressure of supermarket expansion. Another important but rarely discussed reason is that wet markets have achieved systematic improvement with policy support and urban planning. In many Chinese cities, both the supermarket and the wet market are endowed with the responsibility to guarantee food security. In Nanjing, according to a document issued by Nanjing Municipal Government, the city's fresh produce supply is "a food provisioning system based on wet markets complemented by supermarkets' fresh produce zones and direct-sale stores located within residential neighbourhoods" (Nanjing Municipal Government 2011). This highlights the complementary, rather than leading, role allocated to supermarkets in fresh produce supply.

The paper also demonstrates that, contrary to the supermarket revolution model, the relationship between the supermarket and the traditional food outlet is non-linear. The dynamic relationship is reflected in the change of the government's program from *nong gai chao* (converting wet markets to supermarkets) to *nong jia chao* (integrating supermarkets into wet markets). Although *nong gai chao* was believed to be a sign of supermarkets taking the place of wet markets in China, the policy change to *nong jia chao* is not consistent with the model. As an important embodiment of wet market resilience, this transition of the state's understanding of the

relationship between wet markets and supermarkets adds greater nuance to the unilinear character of the model and deserves more attention in future research of supermarket expansion.

Three key policy implications can be drawn from these results. First, this analysis suggests that the complementary development of wet markets and supermarkets helps to meet the cross-platform shopping need of Chinese consumers. Nanjing is a city close to “zero hunger” with a high level of household food security (Si and Zhong 2018). Therefore, it is important for policymakers to recognize the possibility of the coevolution of the supermarket and the wet market in other cities of the Global South (Nickanor et al 2019). Investing in coordinating the roles played by supermarkets, wet markets and other potential traditional retail formats could enhance the adaptability of the food system to better meet diverse household food consumption needs.

Second, the consumer survey results show that wet markets were more popular destinations for fresh food than supermarkets. Meanwhile, it is evident that policy efforts in the form of subsidies for renovation and facilities have greatly improved the overall condition of wet markets in Nanjing. The subsidies also contribute to lower prices of fresh food sold in wet markets, which makes them more affordable for price-sensitive consumers. Nevertheless, they are still outperformed in the shopping environment and shopping conditions by supermarkets. Therefore, incorporating the construction or improvement of wet markets as an essential component of the public infrastructure facilities could be a viable entry point to improving the overall food security in developing countries, especially among the urban poor. Policies should continue to provide support for the improvement of management, environment and services of wet markets.

Third, the wet market functions as a public service and is a part of the social mechanism in urban planning. It ensures both the diversity of and an extensive network of food sources for fresh produce and meat in every neighbourhood. It is important to integrate the wet market with the development of

the city and the daily food needs of residents. When uncertain events like the COVID-19 pandemic hit, cities with food supply chains that depend more on local food supply systems were able to adapt and respond to most food insecurities (Si 2020). This means that to improve the long-term resilience of the food system, the development of diversified food businesses through urban food system planning should be encouraged.

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