

A Study on Temporal and Spatial Characteristics of Shopping Behavior of Migrant Workers in Nanjing

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Keywords: Urban migrant workers, Shopping activities, travel distance, Spatial-temporal characteristics, Nanjing.

Abstract: In the process of rapid urbanization in China, population mobility of migrant workers has become a typical economic phenomenon. Shopping, as the core of consumption behavior of migrant workers, combines the whole picture of their lives together with their housing and employment. Based on the first-hand data of the questionnaire survey on migrant workers in Nanjing City in 2019, this paper summarizes the time characteristics of shopping activities such as frequency, time and duration, as well as the spatial characteristics of travel distance, the activity circle and hierarchical structure. The results show that the higher the grade of goods, the lower the frequency of shopping, the farther the average travel distance is and the longer the shopping time. The hierarchical structure of shopping trip space presents the characteristics of 'polarization and decentralization'. In addition, this paper also points out that the low-grade commodity shopping are more sensitive to family structure and average monthly income and age of families while the high-grade commodity shopping are more sensitive to gender, average monthly income and age of families. The purpose of this study is to better meet the consumption needs of migrant workers, and to provide reference for China's commercial space planning.

1. Introduction

During the process of rapid urbanization, population mobility has become a widespread economic phenomenon. Along with the reform of the household registration system, the transformation of industrial structure, the change of farmers' concept, and the break of urban and rural barriers, a large number of rural surplus labor force has merged into a large-scale army and an unstoppable migrant workers' tide. In this context, the empirical research on the migrant workers in the city, such as housing, employment, shopping and so on continue to receive attention. At present, there are relatively many studies on the housing and employment problems of migrant workers, but there is almost no research on their shopping characteristics. As a kind of marginalized group that travels between urban and rural areas, the migrant workers in urban areas are inseparable to the urban system in the economic and industrial aspects, although they are isolated and excluded to some extent in the social and cultural fields. The important component of the force has a great impact on the urban consumption structure. For this reason, the

study of its shopping characteristics not only helps to better grasp the consumption needs of migrant workers in addition to daily living and employment activities, but also helps to provide reference and basis for the formulation of relevant industrial policies, the guidance of activities and the planning of commercial space, so as to further improve the dual and marginal issues of migrant workers who are non-agricultural and non-industrial, migrating between urban and rural cultures, and provide targeted strategies for this group to eventually integrate into the city and take root in the city.

On the other hand, the research on shopping activities has started relatively early in foreign countries, focusing on the theoretical level and the application of new technologies. It focuses on the construction of quantitative research and mathematical models, and the theory and method system are relatively complete. Earlier research on consumer shopping activities in China has always focused on the macroscopic material and spatial aspects. There are relatively more discussions on the scale of commercial facilities and their spatial structure (Wu Mingwei, 1999), and the introduction of central theory into the urban commercial center system. In the study of spatial structure (An Chengmou, 1990), domestic related research began to focus on consumers themselves. The content mainly includes the differentiation of consumer shopping activities and the exploration of spatial laws and the construction of measurement models. The single or discrete structure of feature or time characteristics is dominant, and the research results of shopping activities under the coupling of time and space are lacking. In addition, the cities selected and paid by domestic scholars in the research scope are mainly concentrated in the first-tier cities, such as Beijing[1], Shanghai[2], there are relatively few empirical studies involving other regions and cities. In addition, although the research focusing on special groups has accumulated a lot in research objects[3], the research on migrant workers is relatively less. The study of shopping activities based on space-time behavior has become the key to understand the economic and social phenomena such as urbanization, urban development and urban consumption structure. Therefore, this paper intends to focus on the migrant workers in Nanjing. Through the combination of "specific groups + specific behaviors", macroscopically grasp and quantitatively reveal the shopping activities of migrant workers in Nanjing from the perspective of time and space.

2. Methodology

2.1. *Research objects*

The migrant workers studied in this paper refer to the economic temporary population from the countryside, that is, the rural surplus labor force that enters the city for employment with the main purpose of making a living and making a profit, which is distinguished from the "middle and high-end immigrants" such as literary and artistic workers, middle and high-level managers and so on.

2.2. *Research area*

Nanjing was taken as an empirical research object. According to the location difference, six migrant workers' gathering points in three different locations in the city center, suburbs and outer suburbs of Nanjing were selected as survey samples. The questionnaire survey on the shopping activities of migrant workers was conducted in Nanjing during the period from January to

March 2019. In the city center, Lu xiying Community in Gulou District and Hong miao Street in Xuanwu District were selected. In the suburbs, Ding jiazhuang Farmers Market and Ma qun Street in Qixia District were selected. In the far suburb, Yin xiang in Jiangning District and New City in Liuhe District were selected.

3. Data

3.1. Data sources

In this study, a questionnaire survey was conducted, and 50 questionnaires were distributed at each gathering point. The questionnaires were filled with migrant workers in the area. A total of 300 questionnaires were distributed, of which 263 were valid questionnaires, and the recycling efficiency reached 87.6%, meeting the needs of the survey. The content of the questionnaire includes two parts: the basic social attributes of migrant workers and the time and space characteristics of shopping activities. There are many discussions about the influence factors of consumers'socio-economic attributes on shopping activities abroad, including commodity type (Clark, 1970), consumption location (Lentnek, 1975), income difference (Llod and Jennings, 1978), age difference, racial difference and so on. Based on the previous research results,

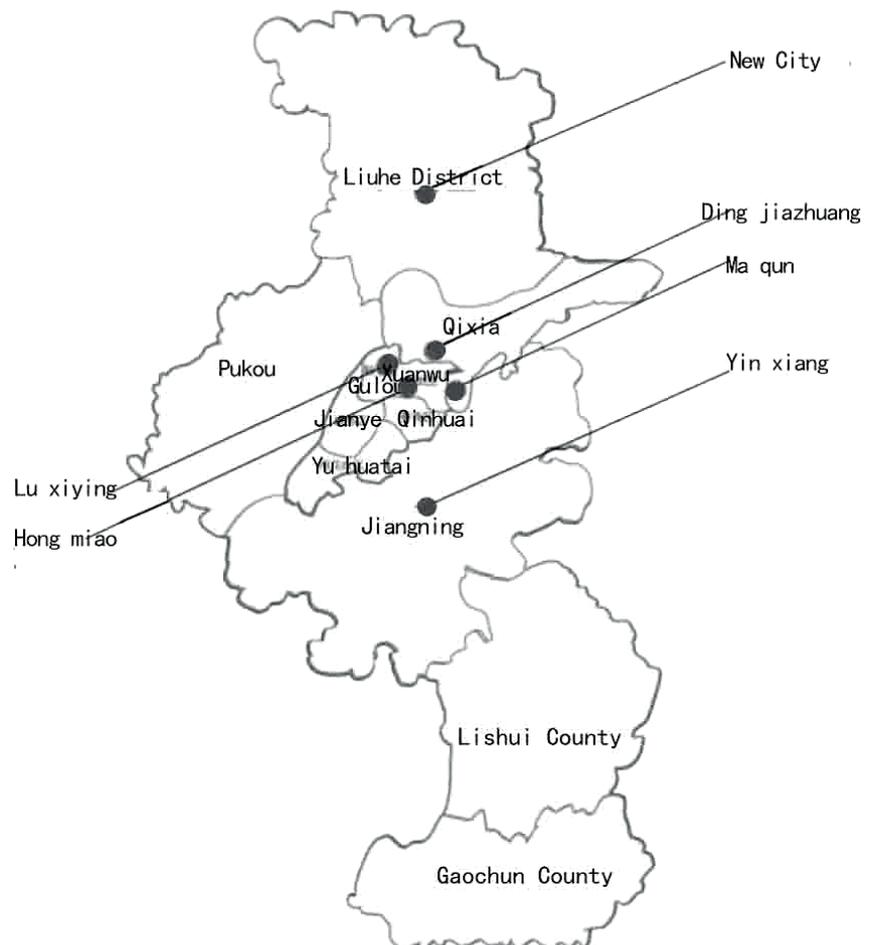


Figure 1. Shows the location distribution of research objects in Nanjing.

this paper mainly considers the social and economic attributes of migrant workers in Nanjing, including gender, age, education level, occupation and average monthly income of family. In terms of time and spatial characteristics of shopping activities, it mainly considers shopping content, shopping time, shopping frequency, purchase location and shopping distance. In addition to the first-hand data acquisition, this paper also combines the relevant information of urban planning, and through POI data analysis of the distribution of shopping facilities at all levels, based on which we discuss the spatial and temporal characteristics of shopping behavior of migrant workers in Nanjing.

3.2. Characteristics of Sample

The proportion of men and women in the sample is balanced. The majority of young and middle-aged people aged 18-40 (61.4%) are aged 18-40, the proportion of the elderly is relatively small (only 6.54%) and the education level is relatively low (65.1%). Most of the respondents are engaged in commercial services (39.6%) or non-fixed occupations (30.9%). The monthly income of families is generally low, and the most of the low-income families are between 3000 and 8000 yuan (57.9%, The lowest income in Nanjing in 2018 was 2200 yuan per person/month), and the family structure was mainly nuclear family (40%), which was much higher than that of couple family and united family (20% and 13.8% respectively). Sample survey of migrant workers can be summarized as young, low-income, small-scale nuclear families, low educational level.

4. Analysis

4.1. Overall time characteristics of shopping activities of migrant workers in Nanjing

Time is an important factor affecting individual shopping activities, which is often closely related to the spatial distribution structure and quantity of commercial facilities, residents' shopping habits and needs, modes of transportation and convenience. According to many existing studies at home and abroad^{[1][2][4]}, combined with the actual situation of urban migrant workers' shopping, vegetable food, daily necessities, clothing, household appliances were selected to represent four different grades and different types of goods from low to high, and the time characteristics of urban migrant workers' shopping activities were analyzed from the frequency characteristics, time characteristics and time-length characteristics.

Frequency Characteristics

In general, the higher the grade of goods, the lower the frequency of purchasing. The frequencies of vegetable and food purchases with the lowest commodity grade were 4.06 times per week, daily necessities purchases were 2.56 times per month, basically 2-3 weeks, clothing purchases were 3.92 times per year, and the average frequency of purchasing household appliances was only 1.56 times per year, and the average frequency of purchasing household appliances was once every six months. From the frequency of shopping types, it can be seen that the shopping frequency of migrant workers in Nanjing city presents the characteristics of daily renewal in vegetable food, monthly renewal in daily necessities, quarterly renewal in clothing and accessories, and annual renewal in large household appliances. Generally speaking, the frequency of shopping for different types of goods of migrant workers in Nanjing is slightly lower than that

of previous scholars' research on urban residents' shopping activities except clothing. This is because most of the migrant workers studied in this paper are engaged in labor industries such as commercial services or non-fixed occupations in the city, their income is relatively low, and their living and eating are provided by the unit. At the same time, in order to save money, they often dare not spend too much outside of their lives, which to some extent reduces the frequency of shopping for high-grade goods.

Period Characteristics

Shopping time is often related to the business hours of commercial facilities and the nature of people's work and living habits. As can be seen from the table, on the whole, the shopping activities of migrant workers in Nanjing on weekends are generally higher than those on working days. As far as commodity types are concerned, the distribution differences of vegetable food shopping activities in working days and weekends are relatively small, while the distribution of the other three types of commodities is quite different, and the four types of shopping activities occur relatively less at night (after 20:00).

According to the specific analysis, the shopping activity time of vegetables and foods is on the two small peaks of the working day before the workday morning (5:00-8:00) and after the afternoon work (17:00-20:00). It can be seen that this kind of necessities are often purchased by way of work due to their short shopping time and close distance, while rest days are mainly concentrated in the morning (5:00-11:00). Daily necessities are relatively time-consuming due to shopping. They are mainly concentrated after work in the afternoon (17:00-20:00), and on weekends (14:00-17:00). When purchasing clothing and large household appliances, migrant workers pay more attention to the price, quality and types of goods, so they have certain requirements for shopping hours. For this reason, shopping activities are mostly concentrated in the afternoon and evening of weekends (14:00-20:00) (Table 1).

Time-Length Characteristics

In addition, the shopping time of migrant workers in Nanjing is positively correlated with the commodity grade. The higher the commodity grade, the more shopping time they spend. 72.5% of the people who buy vegetable food say that the shopping time is less than 0.5 hours, while 62.5% of the respondents who spend time on daily necessities choose 0.5-1 hours. Clothing and household appliances are abundant in variety and expensive, so that people tend to spend more time on travel and comparison. For this reason, the shopping period is mostly on weekends, and the duration is between 1hour and 3 hours (78.6%).

4.2. Overall Spatial Characteristics of Shopping Activities of Migrant Workers in Nanjing

The Hierarchical Structure of Shopping Space

W. Christaller pointed out in the theory of central geography that commercial centers have hierarchy and centrality, that is, the higher the grade, the fewer the number of commercial centers, the stronger the centrality, the more kinds of goods, the higher the service grade, and its functions and service scope as a commercial center can cover low-level commercial centers. At present, many scholars have proved through empirical research that the shopping space of commodities is hierarchical circle structure, which has also been confirmed in this study. The

Table 1. Contains the time distribution of shopping behavior of different commodities.

Periods	vegetable food		daily necessities		clothing		household appliances		
	Person-time	Percen-tage	person-time	Percen-tage	person-time	Percen-tage	person-time	Percen-tage	
Working day	5:00-8:00	54	11.2%	8	2.0%	6	1.6%	5	1.5%
	8:00-11:00	46	9.5%	27	6.7%	20	5.2%	34	10.5%
	11:00-14:00	17	3.5%	12	3.0%	24	6.3%	13	4.0%
	14:00-17:00	32	6.6%	36	8.9%	32	8.4%	27	8.3%
	17:00-20:00	49	10.1%	48	11.9%	36	9.4%	29	8.9%
	20:00-23:00	22	4.6%	24	6.0%	15	3.9%	15	4.6%
	total		45.5%		38.5%		34.8%		37.8%
weekends	5:00-8:00	56	11.6%	18	4.5%	12	3.1%	12	3.7%
	8:00-11:00	72	14.9%	51	12.7%	36	9.4%	36	11.1%
	11:00-14:00	36	7.5%	24	6.0%	37	9.7%	36	11.1%
	14:00-17:00	41	8.5%	72	17.9%	80	20.9%	61	18.8%
	17:00-20:00	36	7.5%	53	13.2%	61	15.9%	39	12.0%
	20:00-23:00	22	4.6%	30	7.4%	24	6.3%	18	5.5%
	total		54.6%		61.7%		65.3%		62.2%
合计	483	100%	403	100%	383	100%	325	100%	

average travel distance of migrant workers in Nanjing is positively correlated with the grade of shopping commodities when they are shopping for vegetable food, daily necessities, clothing, and household appliances. The average travel distance is 1.06 kilometers, 1.32 kilometers, 4.66 kilometers and 5.46 kilometers respectively (this distance is the cognitive distance of residents) (Figure2). Based on the empirical study of the travel distance of urban residents in shopping activities by scholars, the average travel distance of migrant workers in Nanjing is far longer than that of residents in Shanghai, Beijing, Shenzhen and other cities in terms of low-grade necessities such as vegetable food^{[1][2][4]}. W Zongqing and others expressed the W.Christaller market area series as follows^[5]:

$$N_i = K n^{-1} \quad (1)$$

($i=1, 2, 3, \dots, m; n=1, 1.5, 2, 2.5, 3, 3.5, \dots$) In the formula: $k = 3, 4, 7$, respectively, representing the principles of market, transportation and administrative management; N_i denotes the number of level I market areas; n denotes the level of market areas. According to the model, we can calculate the spatial rank series of shopping activities of migrant workers (N_i) under the principles of market, traffic and administrative management, and determine the market level of different commodities (Table 2)

It can be seen that: (1) When migrant workers carry out shopping activities of different kinds of commodities, the travel space basically conforms to the hierarchy relationship in the theory of central land. High-grade commodities travel for a long distance while low-grade commodities travel for a short distance. (2) There is a large span between the travel space grade of low-grade commodities (vegetable food, daily necessities) and of high-grade commodities (household appliances, clothing), the difference is 2-3 grades. (3) There are obvious polarization phenomena among different type commodities of the same grade, the travel space span of different commodities of the same grade is small. For example, both household appliances and clothing belong to high-grade commodities, but the difference of travel space grade is only 0.5. (4) The shopping activities of vegetable food and daily necessities are mainly concentrated in the community-level shopping circle, and have a clear tendency to live nearby, while the shopping activities of clothing and household appliances are mainly concentrated in the district shopping circle (Figure2).

5. The Spatial Circle Structure of Different Types of Goods Shopping

5.1. Community shopping circle concentration: vegetable food and daily necessities

From the travel distance of commodity shopping activities, the spatial structure of vegetable food shopping activities and daily necessities shopping activities of migrant workers in Nanjing is very similar, showing the characteristics of concentration of community shopping circles (Figure 3). The survey data show that the convenience and proximity of travel distance are the most important factors when shopping for these two types of goods. The proportion of shopping activities of these two kinds of commodities within 0.5KM of spatial distribution is 43.9% and 34.4% respectively, and the proportion of travel distance of vegetable shopping activities within 0.5KM is much lower than that of relevant studies on urban residents by other scholars; the proportion of shopping activities of these two kinds of commodities within 1km reaches 75.0% and 60.9% respectively, which means that the strong concentration zones of these two types of commodity shopping activities are within 1km. Within 2km, 92.6% of the shopping activities of

Table 2. Contains the evolution of spatial hierarchy of shopping trips of migrant workers in Nanjing.

Grade	Vegetable food	Daily necessities	Clothing	Household appliances
R_i	1.06	1.32	4.66	5.46
N_i	176.19	113.62	9.12	6.64
n	(6/5/3.5)	(5.5/4.5/3.5)	(3/2.5/2)	(2.5/2.5/2)

The brackets are the corresponding hierarchical relationships of different types of commodities under the principles of market, transportation and administration respectively. (The area of Nanjing built-up area is about 1398.69KM², $R = 21.10KM$, $R_{max} = 2/3R = 14.07KM$)

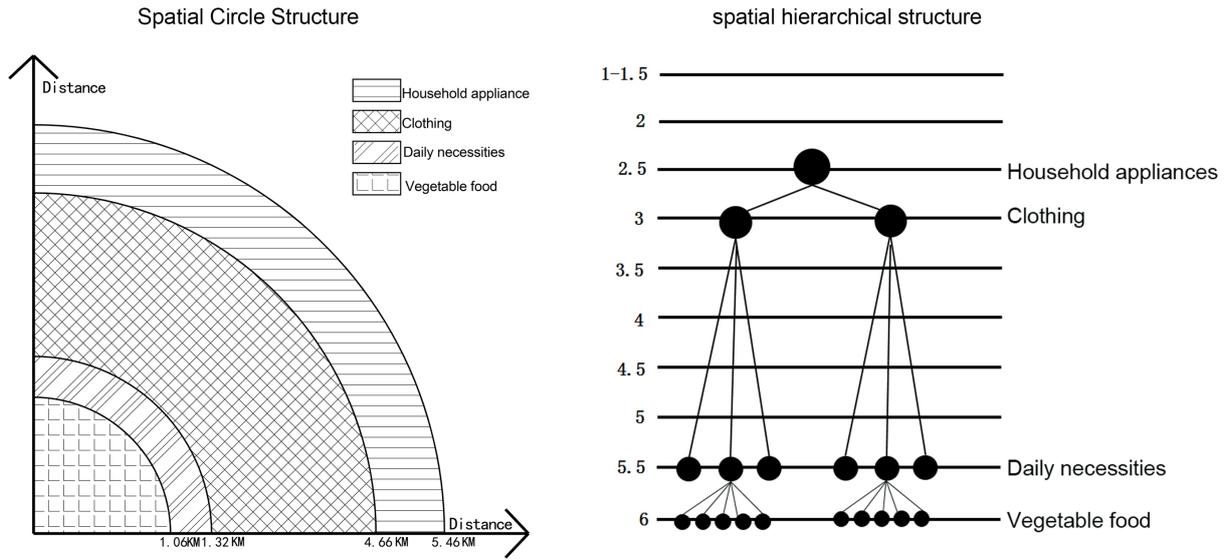


Figure 2. Shows the spatial circle structure and spatial hierarchical structure of different types of goods shopping.

vegetable food commodities and 82.0% of the shopping activities of daily necessities constitute the basic activity space of these two types of shopping activities. Shopping activities of vegetable food commodities outside 2km rarely occur, while within 2km-3km, the shopping activities of daily necessities still occupies a certain proportion. Compared with vegetable food, the shopping activities of daily necessities have the trend of expanding the scope of behavior space and extending the travel distance outward. On the preference of shopping places, 72.9% of migrant workers prefer to go to vegetable markets and other places to buy vegetables food, 81.3% of migrant workers like to go to stores to buy daily necessities. Based on the Poi data of shopping facilities in Nanjing, it can be clearly seen that the distribution density of supermarkets and convenience stores is much higher than that of vegetable food shopping facilities such as vegetable markets (Figure 4). That is to say, the travel distance of vegetable and food shopping activities is relatively far, largely due to the insufficient distribution of related shopping facilities at the material and spatial level, rather than the popularity of “one-stop” consumption mode.

From the time of commodity shopping trip, vegetable and food products reached their destination within 10 minutes had the highest proportion of shopping trips (40.5%). Within this time range, residents are less sensitive to time, and more consideration is given to the price, type and quality of commodities, while the range of insensitive areas of daily necessities shopping activities is expanded to 15 minutes (56.1%). Within 30 minutes, 91.5% of vegetable food shopping activities and 87.8% of daily necessities shopping activities were concentrated respectively. It can be considered that this period of time is a strong concentration time for migrant workers to purchase these two kinds of commodities. However, the upper limit of travel time tolerated by migrant workers is higher than that of vegetable food, which is about 60 minutes (93.5%).

5.2. District shopping circle concentration: Clothing and Household appliances

From the travel distance of commodity shopping activities, the shopping space of migrant workers purchasing clothing and household appliances shows the characteristics of district shopping circle concentration. The proportion of purchasing clothing goods within 1km is 27.4%, while that of household appliances is only 16.8%, which is significantly lower than that of vegetables

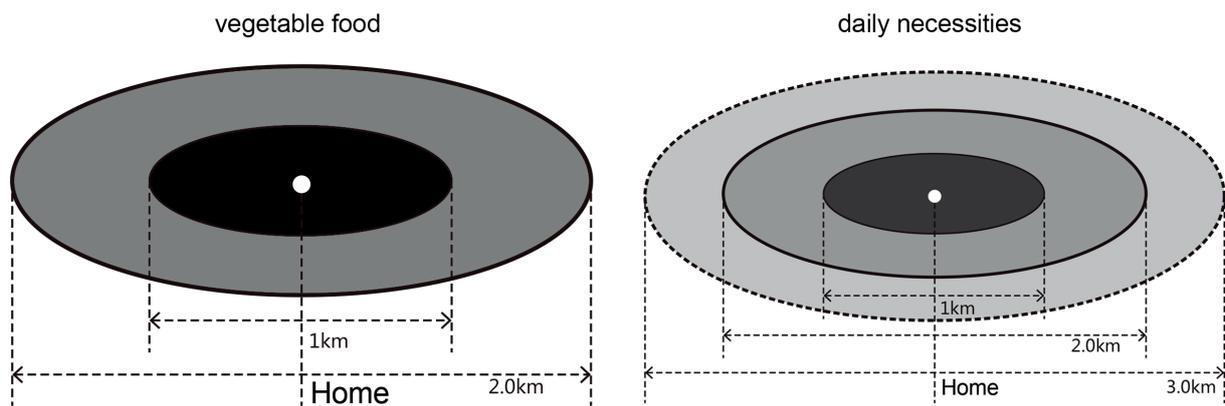


Figure 3. Shows the circle structure of vegetable food shopping activities and daily necessities shopping activities.

and daily necessities. Within the range of 3km, the basic activity space of clothing is formed, and within 5km, it is the basic activity space of household appliances, and the travel distance of shopping activities of household appliances has the trend of extending outward compared with of clothing. There is a certain proportion of shopping activities in all distances beyond 5km, but the proportion of shopping activities is not very high. In addition, 16.2% and 15.9% of migrant workers go to shopping places other than 10km when they buy clothing and household appliances. The price cost is the most important factor (44.3%) when the migrant workers are shopping for clothing goods. For the sake of low price, they prefer to buy clothing wholesale market (16.5%) as well as small clothing shops near the street (28.6%). Based on the distribution of wholesale market in Nanjing, the number of related commercial facilities around the survey site is not large and the distribution is relatively scattered, so there will be a certain proportion of long-distance shopping activities (Figure 4). In addition, 68.4% of migrant workers in the city say they prefer to go to department stores with moderate prices for clothing shopping activities in order to improve the quality and types of goods. The location distribution of such department stores also greatly affects the distance and length of shopping trips for migrant workers (Figure 4). In the shopping activities of household appliances, because of the high price of such goods, the number of purchases in peacetime is small, and the price is less affected by the shopping circle grade, so the quality of the goods has become the most important factor (55.6%) for migrant workers. When purchasing such goods, it shows obvious characteristics of district-level professional stores pointing. Combining with POI data, we can see that such purchases in Nanjing can be seen. The distribution of facilities is scattered and the density is not high, but each district has a core gathering place.

From the travel time of commodity shopping activities, migrant workers are not sensitive to the travel time of purchasing clothing and household appliances. A certain proportion of shopping activities occur in each time period. Generally speaking, within 60 minutes constitute the basic time range of these two types of shopping activities (clothing is 80.2%, household appliances is 80.4%).

6. Analysis of the correlation between temporal and spatial characteristics of shopping activities and basic attributes of migrant workers

The spatial and temporal characteristics of residents' shopping activities are not only influenced by the distribution of urban shopping facilities and their shopping habits, but also by



Figure 4. Shows the POI distribution map of shopping facilities in Nanjing.

the differences of their own socio-economic attributes. This paper uses SPSS 24.0 data analysis software to analyze the samples in the questionnaire from gender, age, family income to explore the correlation between the temporal and spatial characteristics of shopping activities and personal attributes of migrant workers.

6.1. The correlation analysis of spatial characteristics and basic attributes of urban migrant workers' shopping activities

The correlation between the time characteristics of shopping activities of migrant workers and their basic attributes is mainly manifested in the following aspects: (1) Gender aspect: when shopping for clothing goods, the frequency of women's shopping is much higher than that of men's, and the travel time spent is higher than that of men's. (2) Income aspect – the urban migrant workers whose monthly family income is in the middle level are more willing to spend more travel time to buy clothes, which is related to the fact that relatively low-income people pay more attention to clothing price factors, and the higher the average monthly family income, the higher the frequency of shopping on vegetable and food commodities; (3) Family structure aspect: in the frequency of purchase of essential foods such as vegetables and foods, daily necessities, the number of solitary people is much lower than that of the main family and the joint family. This is because most of the migrant workers living alone take part-time work as their focus of life, and their living and eating are mostly provided by their work units.

6.2. The correlation analysis of spatial characteristics and basic attributes of urban migrant workers' shopping activities

The correlation between the spatial characteristics of urban migrant workers' shopping activities and their basic attributes is mainly manifested as follows: (1) Gender aspect : there is no big difference in the average travel distance of urban migrant workers' shopping activities in low-grade commodities, but in high-grade commodities, the average travel distance of women in clothing commodities is significantly higher than that of men, and in household appliances. Shopping distance is lower than that of men. (2) Age aspect: In the shopping trips of low-grade goods, the average shopping distance (over 65 years old) of seniors is higher than that of younger and middle-aged people due to the relatively abundant time of seniors. In the purchase of clothing and accessories, the average shopping distance of middle-aged and young people (18-40 years old) is much higher than that of middle-aged and old people (over 40 years old), but the shopping distance of household appliances is slightly lower than that of middle-aged and old people (Table 3). (3) Income aspect: the higher the income is, the farther the shopping trip distance is. The proportion of urban migrant workers whose average monthly income is less than 5000 yuan choosing to go shopping within 0.5km is obviously higher than the average level (27.6%). The proportion of urban migrant workers whose average monthly income is more than 8000 yuan chooses to go shopping within 1-2km is obviously higher than the average level (25.6%).

7. Conclusion

7.1. Summary of Research

(1) The frequency of shopping activities of migrant workers in Nanjing City in this paper generally shows that the higher the commodity level, the lower the shopping frequency and the longer the shopping time. Compared with urban residents, the frequency of shopping of other three types of goods is relatively low except clothing. In the shopping period, in addition to vegetable food, the shopping activities of the other three types of goods on weekends are generally higher than the working days, and the purchase of high-grade goods is concentrated in the afternoon of the weekend (14:00-20:00). Meanwhile the higher the commodity grade, the less sensitive it is to shopping travel time and shopping activity duration.

(2) The shopping distance of migrant workers in Nanjing is positively correlated with the grade structure of commodities. The higher the grade of commodities, the farther the average travel distance is. The hierarchical structure of shopping space shows the characteristics of "polarization and decentralization". The shopping activities of vegetable food and daily necessities are mainly concentrated in the community shopping circle, while the shopping activities

Table 3. Contains the age differences in shopping space of different types of goods.

		18-40岁	40-65岁	65岁以上
Average travel distance	vegetable food	1.0km	1.0 km	1.5 km
	daily necessities	1.3 km	1.3 km	2.0 km
	clothing	5.9 km	2.5 km	1.6 km
	household appliances	5.5 km	5.8 km	4.1 km

of clothing and household appliances are mainly concentrated in the district shopping circle, while the travel distance conforms to the multi-core and multi-center commercial space structure of Nanjing. Due to the insufficient distribution of shopping facilities in the vegetable market, rather than the popularization of “one-stop” consumption mode, the average travel distance of migrant workers in the vegetable and food commodities shopping is much longer than that of residents in Shanghai, Beijing and Shenzhen. Nanjing wholesale market, middle and low-end department store market and professional household appliances market are less in quantity and relatively scattered, which to some extent promotes the long-distance travel of migrant workers.

(3) The temporal and spatial characteristics of shopping activities of migrant workers with different attributes show certain differences. The shopping characteristics of low-grade goods are sensitive to family structure and average monthly income of families and the age. The temporal and spatial characteristics of high-grade goods shopping are sensitive to gender, average monthly income of families and the age.

7.2. Research Prospects

At present, this paper only discusses the temporal and spatial characteristics of the shopping activities of migrant workers in Nanjing as well as the correlation of their personal attributes. The next step is to analyze the rules and spatial and temporal differences of the shopping activities of migrant workers in Nanjing under the time-geographical thinking of “space-time” coupling, and to construct the decision-making influence model of migrant workers’ shopping activities from the subjective and objective aspects .

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