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The effects of the integration of metro station and mega-multi-mall on consumers' activities: a case study of Shanghai

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Abstract

With large scale development of metro transit systems in many mega cities in China, the advantages of the integration of metro station areas and mega-multi-mall (IMSM) has been widely recognized. This study is designed to understand the effects of IMSM project on consumers' travel behavior by weekday/weekend to provide insights for integrated land use and transportation planning. A questionnaire survey of Wujiaochang Wanda Mall in Shanghai is conducted on consumer activity, followed by the information from the survey to summarize the effects of IMSM on the consumer travel range and the consumer's own properties. Then the research focuses on the effects of IMSM on consumer demand. Finally, the influence factors of consumer consumption, and the influence factors of consumer travel mode are studied through the correlation analysis. The purpose of this research is to solve several questions: 1. whether the IMSM will stimulate consumption? 2. What is the relationship between consumer characteristics and different consumer activities? 3. What is the influence of IMSM on consumer consuming and travelling activities?

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Keywords: metro station; mega-multi-mall; consumer behavior; travel behavior

1. Introduction

The integration of metro station and mega-multi-mall (IMSM) is a city center collecting office, shopping, business, entertainment and etc. And it is also a traffic center for its connecting with metro. With the booming construction of urban metro transit in China, the IMSM is occupying a more and more important position in commercial facilities in the city. At the same time, it has a significant impact on consumer behavior.

China's metro construction is in the period of rapid development. At the end of 2013, the length of urban metro traffic that has been put into operation is reached more than 2000 kilometers. There will be around eight thousand

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kilometers of metro line by 2020 according to urban planning in China. It is a huge span of 10 years of construction scale on contrast with the total of the previous decades. The integration of metro station areas and mega-multi-mall (IMSM) is widely appearing. On the one hand, the metro transportation can bring a lot of traffic, the development of the real estate and the property value; on the other hand, the development of the area along the metro system will increase the passenger flow of metro transportation, providing the stable and continuous growth of the metro transportation ticket income and proceeds of resource development and management. The integrated design and construction of the two is a very important solution to the huge amount of investment and management of the metro transportation system.

Mega-multi-mall is an important place for people to consume. The consumption behavior of urban residents is influenced by many factors, such as geographical position, resident income, population constitute, land use, etc. At the same time it is also subject to the external shopping supply, business management, and the individual's internal consumption characteristics and other aspects including the changes in consumer shopping demands. The integration of metro transportation and mall brings about the aggregation of population and increases the accessibility of commercial facilities. However, not all cases show that the integration of the building is bound to the success of the retail facilities. The effects of the integration of metro station and mega-multi-mall on consumer behavior are deeply discussed in this article. The understanding of the relationship between integration of land use and transport planning increases through several researches: the impacts of the IMSM on the consumer travel range and the consumer's own attributes, the impacts of IMSM on consume characteristics and travel characteristics.

2. Literature review

2.1. Studies of consumer behavior

From a certain angle, the consuming mode of urban residents and its spacial expansion form reflect the maturity grade of the development of city. They have important reference value for planning and constructing urban commercial material environment and understanding urban commercial spacial structure change. People gradually realize the importance of them to consumption and production. The attitude and purchasing behavior of consumers have become the important factors which can influence the position decision made by retail enterprises.

The research on geography of consuming behaviors is attracting more and more attention since 1980s. Activity-based Approach integrates subjective selection factor and objective limitation factor. It researches a series of process from the generation of shopping demand to the appearance of shopping behavior. In addition, it makes consume activity connect with travel behavior. Potter(1982) put forward the structure of information filed and utilization field with the shape of wedge and the plane of sector. Potter pointed out that it centered on the residences of consumers and converged to central business zone. In our country, the research on the position of retail industry and the consuming behaviors of consumers started from the end of the last century. Wu Zong-qing(2001) regarded individual as analysis unit and explored the spacial feature and grade structure mode of the shopping of the residents in Tianjin based on geographical theory of commercial center. By using two econometric models, Zhang Wen-zhong and Li Ye-jin（2006） analyzed the influence of residents’ attributive characters and the evaluation on commercial environment on the consuming position selection of urban residents. A lot of research is to understand the formation and development of urban commercial space from the perspective of consumer behavior and social economic attributes. These studies constitute the basis of this study. Nowadays, a large number of metro transportation appears, as well as the integration of metro station and mega-multi-mall. The construction of them has the impact on consumer behavior. It attracts much attention, leaving a lot to explore.

2.2. Studies of the influence of metro transportation on business

Lin Geng （2003）pointed out that natural regional coexistence relationship existed between business and traffic; perfect traffic facilities such as arterial roads and important traffic nodes can easily form commercial functional zone. The research of Li Wen-ling and Yan Xiao-pei（2002）indicates that new commercial corridor can easily form along metro. Cai Guo-tian, Chen Zhong-nuan(2004), and Huang Jun-Lin, Fu Lie-shan(2010) believe that the metro traffic greatly improves the accessibility, attracting more visitors. The large number of commercial, residential area, office

activities attract people to gather around fast traffic line, and bring enormous flow of people thus affecting the commercial retail development layout and the development. Lin Geng, Zhou Su-hong (2008) points out that along with the completion and operation of the metro, Shenzhen consumption pattern gradually diversified. The emergence of urban metro transit has drew much attention to the layout and consumption structure of commercial activities. However, most of these studies have analyzed the spatial structure from macro level, and the study of consumer behavior from micro level is not much.

At the same time, underground consumption space expands all the time. Fang Xiang yang and Chen Zhong-nuan（2005）divided the converge types of underground businesses beside the entrance of metro into three categories: hall shops, passageway shops and the underground business streets directly connecting the entrance. Huang Ying-ying, Chen Zhong-nuan and Chen Qu（2006）regarded Guangzhou city and Tianjunhe Fashion Frontline Underground Business Street which connected the exit of metro as the research objects. Comparison was made between them in the aspects of their features and consumers' attribute. In addition, the relationship between underground business street and consumers' attribute was analyzed. The researches extent their study object to the commercial place around the metro station area. We can find that there is a little whose research object is the integration of metro station and mega-multi-mall.

3. Methodology

The research methodology for this research employed both included quantitative and qualitative methods to enable a better understanding of the effects of the IMSM on consumers' activities at Wujiaochang Wanda Mall. Based on the study object, the questionnaire survey is designed considering a sample group of IMSM consumers. The appropriate sample size and distribution for a consumer-based survey is determined largely by three factors: (1) the variable interests of all kinds of consumers; (2) the acceptable error margin; (3) the survey samples available.

3.1. Site selection

The research chose Wujiaochang Wanda Commercial Mall in Shanghai from those are connected to a metro transit line, and is in typical mall area. As the research objects, the mall is with Metro Transit Line No. 10 nearby, and here is also the deputy city center. Wujiaochang Wanda Mall has an planning area of 6.012 hectares, with a total construction area of 334 thousand square meters. It is designed to cover the regional population about two million in planning. The main type of business include: Wal-Mart shopping plaza, Paris Spring Stores, the First Food Plaza, Wanda International Cinema, Shanghai Bookstore, Hele International Furniture Plaza and Gold and Jewelry City. There are three office buildings in the food building, Wanda International studios and Wal-Mart. The ground floor is located in the leisure shopping plaza, which is characterized by dining, entertainment and leisure. The area around plaza has convenient traffic. It constitutes a three-dimensional transportation network with the Middle Viaduct, underground pedestrian traffic corridor, ground transportation, sinking pedestrian plaza and the metro. Metro Line 10 station and Wujiaochang Wanda Commercial Mall are connected at the basement.

3.2. Data sources and sample distribution

The questionnaire is designed including the following three aspects: 1, the basic information of consumers; 2, travel behavior survey; 3, consumer behavior survey. In order to study the influence of the mall on the consumer behavior more deeply, the investigation has also added some subjective evaluation of the factors, such as the conditions of the decision, in addition to the fact objective description. The first part of the questionnaire is consumer information, including gender, age, occupation, etc., as well as what transportation vehicles do their family has. The second part is travel behavior and choice survey. The main contents of the part are consumers' departure places, travel mode, travel time and the reasons for choosing the mall. At the same time, and the situations of the choice of consume and travel mode based on the assumption that without metro are also investigated. The third part of the consumer survey includes consumption time, frequency, content, amount and other issues. The questionnaire comprises qualitative and quantitative questions. There are fifty six questions in one sample, including a majority of selection question and a fill-in of consumer's departure place. The investigation time is on Wednesday, Thursday and weekends in two

continuous weeks in May 2015. The questionnaire spans 4 working-days and 4 week-ends, avoiding the national holiday that may influence the usual influence and the research result greatly. The date choosing supports the typical effect the paper concerned. Investigation sites distribute in the various floors of Wujiaochang Wanda Mall. The person the questionnaire survey aims at is the shopping mall consumers. 140 questionnaires were distributed totally, including 50% of the working days and 50% of the weekends. The gender rate of the survey object is 1 to 1. Finally, 120 effective questionnaires were collected.

3.3. Data processing method

Based on which gains from the questionnaire survey, the consumers of the IMSM are studied covering the departure places and the characteristics of consumers, and the influence of the IMSM on the travel mode and consumption behavior of consumers.

- The impacts on consumer travel range and consumers' own attributes

In the road net of Shanghai city, consumers' departure places toward commercial complex are input through the Transcad software; by using "shortest distance method", the distance of going out to go shopping can be calculated. In the process of calculation, it shall be subject to the house numbers along the road. Only the shortest distances in road net are calculated. In this way, the distance of going out to go shopping in consumers' different modes of going out can be got. The assumption of whether people will go shopping without metro in questionnaire is regarded as the partitioning basis to get the conclusion that consumers will also come to commercial complex if there is no traffic connection. Through comparison, the influence of the integrated construction of pathway traffic and commercial complex on consumers' scope of going out is researched.

The attributes and consuming demands of consumers are described from the features of the samples of survey. The sample in which there is the assumption of people going shopping without metro is selected to describe the attributes and consuming demands of consumers. Through comparison and relevant analyses, the influence of the integrated construction of pathway traffic and commercial complex on consumers' features is researched.

- The impacts on consumer demand and travel mode

In questionnaire, there is an assumption that whether people will change their mode of going out or not go shopping there if there is no metro. This assumption is regarded as the partitioning basis to divide the people into two groups—the people who are not influenced and the people who are influenced. The influence of the integrated construction of pathway traffic and commercial complex on consumers' consuming demands is researched. And then, through the correlation analyses, the influence of consumer behavior and travel mode is studied.

4. Data and analysis

4.1. Characteristics of consumer travel range

The departure address and the departure distance of all the investigated consumers are studied through Transcad software. In addition, the same research is done based on the samples whose choice is they will still come here to shopping according to the hypothesis that if there is no metro, ignoring whose choice is not. The comparison of the two study progress leads to the following conclusions (Table 1, Table 2, Fig. 1).

Table 1. Consumer travel distance description statistics (unit: m).

	Minimum	Maximum	Mean	Standard deviation
Samples choose to come assuming there is no metro	380.21	18521.23	4760.63	4228.559
Full samples	380.21	27854.22	5850.67	5555.668

Table 2. Comparison of consumer travel distance distribution.

Group	<1km	1-3km	3-5km	5-8km	8-10km	10-15km	>15km
Samples choose to come assuming there is no metro	15.0%	30.2%	27.1%	15.2%	6.7%	3.6%	2.2%
Full samples	13.5%	23.3%	24.8%	18.9%	7.0%	4.8%	7.7%

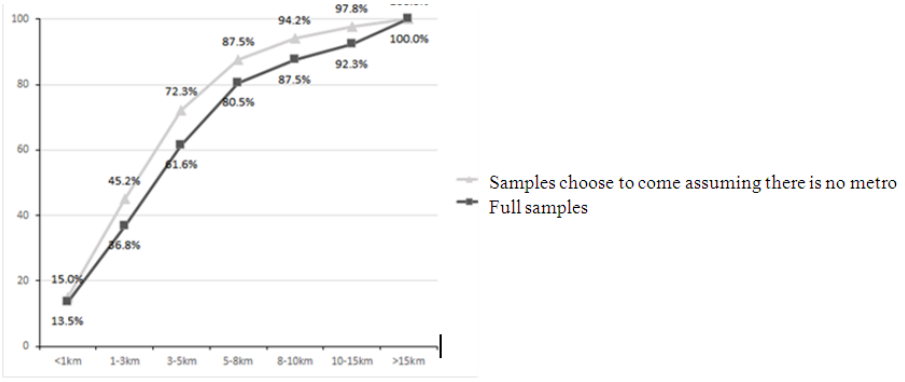

Fig. 1. Cumulative percentage of consumer travel distance.

The average travel distance of the residents who choose to come to the mall even there is no metro transit is 4.7km. It is lower than 5.8km, the average travel distance of those who choose not. (Fig. 2, Fig. 3) 5km is the range travel distance suitable for bicycle. In those who are assumed to come to the mall even without metro transportation, the ratio of whose travel distance is within the 5km reaches 72.3%, while the ratio in the other option is 61.6%.

Fig.2 Fig.3

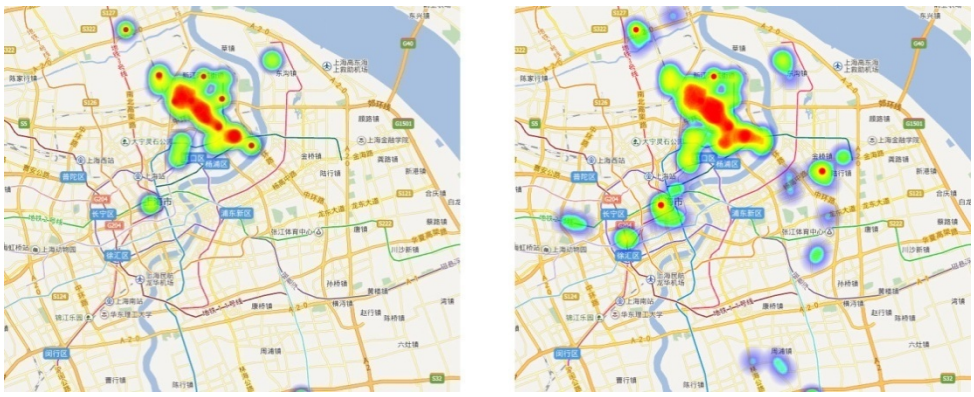

Fig.2. Sketch of the consumers' departure places assuming there is no metro.

Fig.3. Sketch of the consumers' departure places.

4.2. Consumer characteristics

From the survey, the consumers' age is mainly concentrated at the rage of 18-35 years (64.9%) in Wujiaochang Wanda, followed by 36-50 years (24.3%). The main types of career are the staff in state-owned enterprises, public institutions and foreign enterprises, followed by students and free professional and civil servants. The least are unemployed people and retirees. Most of the education background is undergraduate and above, accounting for 63%. The highest proportion of monthly income is accounting for 35.1%, which means 2000-6000 RMB per month.

The majority of consumers' spending time on the road is within 15-30 minutes. If adding those whose travel time is within 15 minutes, the ratio of the number of the people whose travel time is within 30 minutes to the total number, is 77.5%. (Fig. 4)

90% of the respondents chose here as the mega-multi-mall they come most frequently. In the choices of reason for what they choose here, 58.5% of respondents chose the reason that it is close to the metro or the distance is closer to their departure place. 56% of respondents chose the reason that the shopping mall has better environment, larger scale, more variety than other malls and other attractive characteristics of the shopping mall. The amount of the day of the survey was mainly distributed between 100-500 RMB, accounting for 61.9%. 18.9% of the consumers come here alone, 81.1% of consumers come here with companion. According to their travel mode, another research is done on the samples that will come to the mall even without metro. Comparing their properties in two researches, it is found that in the situation with metro, consumers will be younger, the proportion of students and freelance grow at, respectively, 1.7% and 2.2%. At the same time it can be seen that the proportion of average monthly income and education level etc. has no significant change (gap is within 1%).

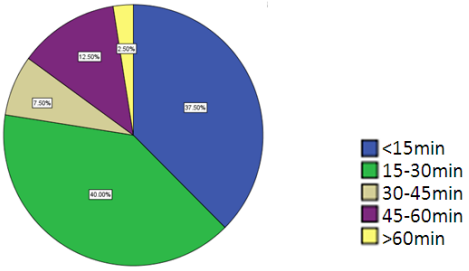

Fig. 4. Distribution of the time spend on road.

The correlation analysis shows that the option whether the availableness of metro will affect consumption is related with some individual characteristics and travel characteristics of the customers. It is closely related with the travel time, the starting point and the distance from the starting point to the metro traffic station. When the metro transport is unavailable, consumers here always spend less time on travel and are farther away from the metro traffic station. (Table 3, Table 4) That is to say, people around the metro traffic station are largely affected by the metro traffic. (Table 5, Table 6) And it is weakly related with the age, monthly income, car ownership, travel distance, consumption amount, consumption time, consumption frequency, etc.

Table 3. Availableness analysis of whether the consumers come or notwhen there is no metro on the deferent time spending on roads.

Group	Rank mean	Z	P
Come when there is no metro	58.43	-2.436	0.015
Not come when there is no metro	86.00		

The above table shows that when the metro traffic is unavailable, the rank-sum test for two independent samples of whether people, spending differently to come here, will choose to consume here or not was that $P<0.05$. Therefore, it is different for people with different time spending on the road to come here to consume. And consumers who will come when there is no metro always spend less time on road.

Table 4. Distribution comparison of consumer travel time.

Group	<15min	15-30min	30-45min	45-60min	>60min
Come when there is no metro	43.10%	42.50%	7.90%	3.40%	3.10%
Not come when there is no metro	36.50%	38.70%	10.70%	7.30%	6.80%

Table 5. Availableness analysis of whether the consumers come or not when there is no metro on the deferent distance from the departure place to the nearest metro station.

Group	Rank mean	Z	P

Come when there is no metro	63.91	-4.152	<0.001
Not come when there is no metro	18.50		

The above table shows that when the metro traffic is unavailable, the rank-sum test for two independent samples of whether people, with deferent distance from the departure place to the nearest metro station to come here, will choose to consume here or not was that P<0.05. Therefore, it is different for people with deferent distance from the departure place to the nearest metro station to come here to consume. And consumers who will come when there is no metro always have longer distance from the departure place to the nearest metro station.

Table 6. Distribution comparison of the distance from the departure place to the nearest metro station.

Group	<300m	300-500m	>500m
Come when there is no metro	27.1%	18.9%	54.0%
Not come when there is no metro	65.7%	31.2%	3.1%

4.3. Effects on consumer demand

The survey shows that 87.5% of consumers think the mega-multi-mall around the subway station can enhance their desire to consume here. And 53% of consumers think that it will add their extra consumption here because of the convenience. As for their consumption reasons, 42.5% of them choose the good type of business, and 25% of them choose the appropriate distance. 45% of the respondents choose to consume from 17:00 to 20:00, and 28% of them choose from 11:00 to 14:00. And most consumers, 42.5% of them, choose to consume for 1 or 2 hours, and 67.5% consume on weekends and their consumption frequency is 1 to 3 times a week. Here, the consumption type with the highest consumption rate is catering, and most consumers, 65.0% of them, consume 100 to 500 RMB.

The differences in the consumption amount of different periods were found by the rank sum test of independent samples, and the consumption amount of 14-17 o'clock was the highest. There is a difference between the consumption amount of different consumption dates. The consumers tend to spend more money on weekends. (Table 7)

Table 7. Analysis of consumption amount on different dates.

Group	Rank mean	Z	P
Working-day	44.00	-3.084	0.002
Weekend	64.63		

Research the correlation of individual attribute, consumption and travel characteristics and consumption amount through correlation coefficient method. From the research, we can see that consumption amount is related with consumer age, travel distance and the choice of consumption time length and consumption date but not related with monthly income, consumption frequency, and whether choose metro transport method or not.(Table 8) We can see from the graph that consumption amount is negative related with customer age, positive related with travel distance and consumption time length, and not related with monthly income and consumption frequency at 5% level.

Table 8. Analysis of the different consumption amount with age, monthly income, travel distance, consuming time length and consumption frequency.

	consumption amount	age	monthly income	travel distance	consuming time length	consumption frequency
consumption amount	1					
age	-0.199*	1				
Monthly income	-0.064	0.269**	1			
Travel distance	0.206*	-0.301**	-0.073	1		

Consuming time length	0.487**	0.076	-0.012	0.323**	1	
consumption frequency	-0.042	0.071	0.272**	-0.034	-0.003	1

Note: * indicates P<0.05; * * indicates P<0.01

Classify informants according to whether choose metro transport method or not and over 80% of them accept that IMSM can inspire consumption desire. Classify informant into affected people and unaffected people according to whether come or not if there is no metro transport and research the influence of IMSM on consumption demand of customers. From the research, we can see that there is no obvious change in consumption type distribution. But for the people that choose metro transport, their average age is younger, consumption time is longer, average single consumption amount is lower and the possibility that monthly consumption frequency that is over 11 times is lower.

4.4. Effects on consumer travel mode

For travel method choosing, we can see that time-saving, comfortable and safe are more important than other factors. The correlation analysis shows that gender is related with travel method choosing. More female chooses metro or bus and more male chooses car or walking. People that have different distance from departure place to station will choose different travel method. If the distance is close, people are more likely to choose metro or walking. If the distance is far, people are more likely to choose car or bus. Correlation analysis also shows that the choice of travel method is also related with whether there is direct bus line and different monthly income level.

5. Conclusion and discussion

This study was conducted to explore the effects of the IMSM on consumers' activities. Some conclusions can be drawn: (1) Integration of metro station and mega-multi-mall can expand the radiation domain of the mega-multi-mall. More people will come because of the metro from places farther spending more time on the way and at the mall. (2) As to the reason for which they consume at the mall, more than half of the consumers investigated choose the existing metro. And their choices are largely affected by metro traffic whose departure place is within 500m from metro station. (3) IMSM has more attraction to those who are younger or have lower income.

The site of the study is Wujiaochang Wanda Mall. It is a typical IMSM in Shanghai. The study in part understands the research area, however something background must be concerned such as malls are a product of a layering of historical, social, cultural, economic and regulatory factors. The comparison with other similar studies indicates that the effects of the IMSM on consumers are not sure to happen as at Wujiaochang Wanda Mall. These effects are influenced by the location of the mall, the business relationship among nearby, the positioning of their own business and the development of the underground space. Wujiaochang locates in Shanghai sub-center with convenient transportation, and well-developed commercial environment. Many colleges, universities and residential areas are around it, providing huge flow of people as the basis for the IMSM development. The sinking pedestrian plaza provides an effective way to enter the mall for the metro passenger. Wujiaochang Wanda Mall has the combination with metro line 10 in a specific feature in such an external environment. All of these need to be examined. More research should be carried out because of the complexity of the impact.

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