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THE UNIVERSITY OF HONG KONG

THE EFFECT OF HOMOGENEOUS RETAIL AGGLOMERATION UPSTAIRS ON RATEABLE VALUES

A DISSERTATION SUBMITTED TO
FACULTY OF ARCHITECTURE
IN CANDIDACY FOR
THE DEGREE OF
BACHELOR OF SCIENCE IN SURVEYING

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY
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HONG KONG

APRIL 2009

DECLARATION

I declare that this dissertation represents my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

Signed: _____

Name: _____

Date: _____

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ABSTRACT

Why do shops selling similar or homogeneous products group together in a cluster? What are the motivations to locate next to their competitors? This mysterious phenomenon draws scholars' attention. Harold Hotelling (1929) was the pioneer to explain the phenomenon in a systematic theory. Chamberlin (1933), Eaton and Lipsey (1979), Konishi (2005) and Wolinsky (1983) further developed the theory by integrating the concept of comparison shopping and search cost. However, there is no previous work on the relationship between the phenomenon and retail property rentals.

Hong Kong is a dense city, where retail shops agglomerate in several crowded districts. The retailers cluster on the same street, or the same building to benefit from: increasing market sizes, advertising effects and entering the existing markets. As the cluster is a desirable location for retailers, rental value of the stores may be bidden up. In this dissertation, it aims at testing whether homogeneous agglomeration adds premium to retail rateable values. Regression analysis revealed that the relationship between the two is positive. In other words, homogeneous agglomeration adds value onto properties.

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Chapter 1

Introduction

1.1 Background

Retailing is one of the most important sectors in all developed countries. According to Census and Statistics Department, there are approximately 220,000 people engage in retail sector in Hong Kong. The total retail sales is HK$273,000 million in 2008.

Hong Kong's population density is one of the highest cities in the world. Limited land with hilly relief hinders development. Moreover, population is unevenly distributed. Therefore, location choice is crucial for retailing that is highly affected by accessibility. In the bid rent model, retailing has the steepest bid-rent curve. They are most likely to give the highest price for the site in city center.

Fernie (2003) pointed out that "location strategy forms a major strand of corporate retail strategy which is crucial due to the importance of location in customer choice, the level of investment in buying, leasing or building retail units, and the financial consequences of poor location decision."

Mong Kok, Causeway Bay, Tsim Sha Tsui and Central are the main shopping districts in Hong Kong. Mong Kok gets the densest retail development among the four districts. According to the retail survey conducted by Planning Department (will be discussed in chapter 5), Mong Kok was the most desirable place for both retailer and customers. In this dissertation, Mong Kok is chosen as the study area.

Besides, there are different types of retail properties in Hong Kong. They include large-scale and well planned shopping malls (e.g. New Town Plaza in Shatin, Pacific Place in Admiralty, Festival Walk in Kowloon Tong, APM in Kwun Tong); newly developed shopping malls in previous industrial site (e.g. Mega Box in Kowloon Bay); local small shopping centres in the public estates, wet markets, street level shops and also upstairs shops. Besides, an interesting phenomenon is found that shops selling homogeneous products clusters on the same street or in the same building. There are plenty of examples, such as Golden Computer Centre and Apliu Street in Sham Shui Po, florist shops in Prince Edward, sports shoes shops in Mong Kok and jade market on Canton Street.

This phenomenon has been in a great interest by many scholars. Hotelling (1929) was the pioneer constructing the principle of minimum differentiation to explain it. His

model is only true theoretically and can hardly explain the real world. However, his theory inspired further studies on the topic, such as Chamberlin (1933), Eaton and Lipsey (1979), Konishi (2005), Rogers (1965), Shilnoy (1981), Stuart (1979) and Wolinsky (1983). Their contributions enrich our understanding on the reasons behind agglomeration. Similar works have been done in Hong Kong (LI, 2005; SIN, 2003). They try to find out under what conditions firms will cluster.

However, agglomeration effect on the retail property value has never been examined. Agglomeration is desirable for both sellers and buyers for enlarging market size, advertising effect, and reducing search cost. It is reasonably suspected that agglomeration effect in a building will raise rental value, as sellers are willing to pay a higher bid. Therefore, this dissertation is trying to fill the gap and examine whether retail homogeneous agglomeration adds value to rateable (rental) value.

1.2 Objectives of Study

The aim for this dissertation is to test whether homogeneous agglomeration adds premium to rateable (rental) value. To achieve the aim, there will be comprehensive study on three areas.

1) To review related literatures and understand the issue of agglomeration.

2) To generally overview the agglomeration situation in Hong Kong, especially in Mong Kok.

3) To develop a hypothesis and collect data for testing the hypothesis.

1.3 Significance of the Study

Understanding the spatial distribution and agglomeration phenomenon of retail is essential. It is believed that agglomeration is an important element affecting business performance and it is mutually beneficial to retailers and purchasers, as well as to society. At the past, most of the researches on determinants of retail rental value have never focused on the effects of agglomeration. However, understanding its effects helps developers, professionals and store owners to make decision on site selection and market analysis. As revealing agglomeration is adding premium to retail property value, careful floor planning and grouping of retailers selling homogeneous products should be implemented.

1.4 Organization

This dissertation consists of eight chapters to form a framework for the study. Chapter 1 provides general information about this research topic including background information and objectives of the topic. Before developing hypothesis, literatures on

agglomeration should be reviewed comprehensively. Central Place Theory, the Principle of Minimum Differentiation and search cost literature is reviewed in Chapter 2. After having basic understanding on agglomeration and related issues, Hong Kong situation on agglomeration is reviewed in Chapter 3.

In chapter 4, hypothesis development is illustrated and theoretic framework for this research is developed. Chapter 5 discusses reasons for choosing the targeted district and buildings for the research. Furthermore, it demonstrates how the data be collected and where their source are. Definition and description of rateable value is also given.

Chapter 6 illustrates methodology of the research. It starts by reviewing the hedonic price model. Then, it follows by reviewing the techniques and components of regression. After that, independent variables are chosen with reference to literature review. Finally, regression equation can be constructed.

Chapter 7 shows the regression result and discussion. Lastly, Chapter 8 concludes the findings and implication.

Chapter 2

Literature Review

2.1 Introduction

The study of retail has been in a great interest by many scholars. There are series of studies or researches about retail location, marketing, planning, etc. To understand homogeneous retail agglomeration and its benefits, retail location model and principles will be reviewed and critically analyzed in this chapter. Central Place Theory and the principle of minimum differentiation are studied to understand spatial arrangement of retail stores. The theory of search is useful to understand behaviours of customers and sellers. They altogether form a framework for studying homogeneous agglomeration phenomenon.

2.2 Central Place Theory

2.2.1 The Theory

Retail location is affected by both centralization and decentralization forces. These two forces add together and determine the location of retail stores.

Central Place Theory was formulated by a German geographer, Walter Christaller and

a German economist, August Losch. It is a theory focusing on the location of settlements of different sizes. It can explain spatial organization of settlements and their hinterlands. It was the most innovative and most successful attempt to construct a fully realized theory of spatial structure (Stevens, 1985).

There are several assumptions:

1. Unbounded uniform plain/ isotropic surface:

   There is equal transport in all directions within the land. Transport cost is in direct proportion to distance. The longer the travel distance, the greater the transport cost will be. The population was evenly distributed.

2. Rational and economic man:

   Suppliers are economic men, so they are profit maximizers. They locate their stores where maximum profit can be generated.

3. Minimizing travel:

   All customers travel least distance and buy from the nearer central place.

It proposed that each centre is serving a hexagonal hinterland, so there will not be area remain non-served or overlapping.

It brought out two important concepts: range and market threshold. Range of a good is the maximum distance that a customer is willing to travel for purchasing a good. Different goods have different size of ranges. Durable goods have a bigger range, while non-durable goods have a smaller range. For example, daily necessities, such as newspaper, food and grocery have a smaller range, it means that people consume from the nearby stores.

Threshold is the minimum number of people required to support the provision of a service or good. Threshold analysis determines the number and location of retail centres using the minimum return necessary for the retailers to break even (Berry, 1958). Different services and goods have different thresholds. The more expensive and less frequent purchase goods or services have a larger range and threshold, such as diamonds, cars, etc, which is called high order goods. The goods or services with smaller range and threshold is called low order goods. As long as the range is larger than the threshold, supplier can have a profit.

Hexagonal central places in different orders together make up the central place hierarchy. The number of functions provided and size of the trade area determine the order of a central place. Generally, the higher the order of a central place, the larger is

the area and the greater is the number of settlements. In order words, there are several central places in different orders, for example: 1st order central places, 2nd order central places, 3rd order central places, and so on... The higher order central places are formed by several lower order central places. They together form a central place hierarchy, like Fig. 2.1.

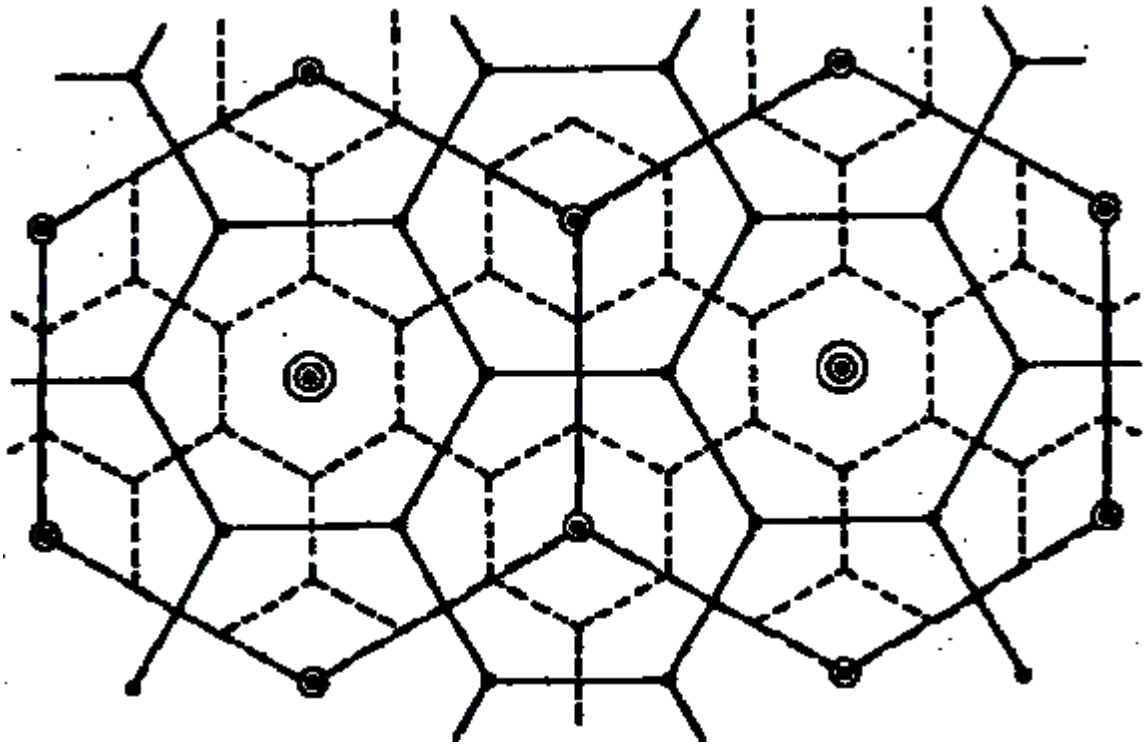

Fig. 2.1 The hierarchy of central places

Under the above assumptions and concepts, Christaller constructed three principles: marketing principle (K=3), traffic principle (K=4) and administrative principle (K=7). K-value is determined by the number of lower order centres served by the next higher

level of central place (O'Brien, 1991). These principles show the relationship between position and size of settlement.

The theory was further developed by Berry and Garrison (1958). They applied the theory to the USA situation. Through an empirical studies, they found that Chistaller's theory still applicable to the real world situation where isotropic conditions was absent. They were the first applying central place principles to the internal spatial organization of cities (Brown, 1992). The hierarchy could be found even the assumptions of even population density and equal purchasing power was released. They also found the hierarchy structure could be observed inside individual urban areas.

2.2.2 Criticisms and Significance of the Theory

Though it is the first theory trying to find out the relationship between location and size of settlements, also the distribution of retail stores in a systematically way. There are many criticisms on the assumptions of the isotropic condition and economic behaviour of customers. A host of empirical evidence, however, attests to the fact that shoppers do not inevitably patronize the nearest centre (Clark, 1968).

Past studies also criticized single-purpose shopping trips proposed by Christaller was not applicable. Buursink (1981) criticized that Christaller made no explicit statement to this effect. The customers tend to buy different categories or orders of goods for the shopping trip, so multi-purpose shopping trip is resulted. Though the limitation of Christaller's model, latter-day attempts to develop a dynamic model incorporating multi-purpose shopping behavior appear to be meeting with some success (West, 1985).

Moreover, this theory was developed over 70 years ago based on the situation of Germany. The scholars commented that it was no longer applicable, because of the changes on social and technological. Furthermore, the increasing car ownership and refrigerator ownership release the geographical constraints.

Nevertheless, central place theory has given extremely useful terms of reference and organizational concepts within which to examine systemic regularities in settlements and shopping centres. The main purpose has been to provide a general classification of size orders within which individual settlements and/or shopping centres may be more consistently compared (Davies, 1985).

2.2.3 Implication of the Theory

Follow the theory, shops selling homogeneous products should separate over the country. Retailers would disperse and locate away from each other. We cannot observe homogeneous agglomeration under Christaller's model. In contrast, agglomeration of heterogeneous goods and services will result at the centres.

The concept of range and threshold together shows the co-existence of both high order and low order goods in central places. Where high order goods will be sold in the higher order centre where serving larger population than the low order centres. Retailers selling high order goods spread over in high order centres and retailers selling low order goods spread over in low order centres. They locate away from their competitors. Theoretically, no retailers selling the same product would locate at the same centre.

Under this theory, it is obvious heterogeneous agglomeration is observed. However, it is not fully applicable to situation in Hong Kong, where homogeneous agglomeration is normally observed. There must be other theories to explain its existence.

2.3 The Principle of Minimum Differentiation

2.3.1 The Theory

Why do shops selling similar goods or services concentrate in the same area? Why do shopping centres gather different types of stores? These questions can be answered using the concept of agglomeration. It includes homogeneous and heterogeneous agglomeration. In this dissertation, the focus will be on homogeneous agglomeration.

Agglomeration is an interesting phenomenon drawing lots of attentions in land economics. Many scholars have contributed in this topic. Harold Hotelling (1929) was the pioneer generating the concept of agglomeration in a systemic model, which was published in a journal paper called 'Stability in Competition'. His paper tried to prove price stability can be obtained in the case of duopoly which selling similar product.

The following are Hotelling's assumptions:

1. two firms selling identical goods
2. profit maximizing sellers
3. a bounded linear market
4. transportation cost is directly proportional to distance traveled

5. completely inelastic demand

6. evenly distributed customers with equal purchasing power

7. utility maximizing customers

He then further elaborated that if sellers were free to move, they would choose the site where can maximize their market share. The leap-frogging process as suggested by Chamberlin (1933) would result. The diagram below was extracted from Brown (1992) showing the leap-frogging process.

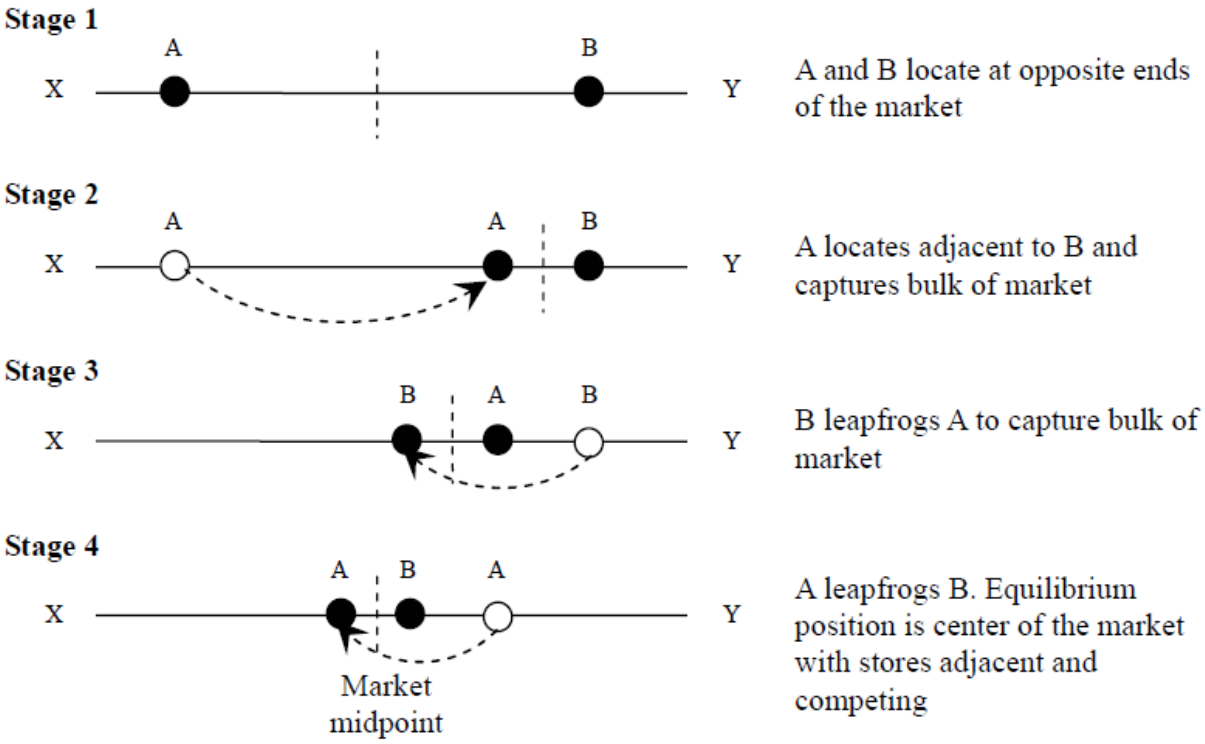

Fig. 2.2 Leap-frogging of two firms

The firms originally located at the mid-point of two edges (stage 1). Each of them shared half of the market. It is a social optimal situation, where minimizes customers' transportation cost. Maximum distance traveled is 1/4 km. However, they were profit maximizers and aimed at maximizing their market share. They were footloose, A located next to B for maximizing its market (stage 2). By taking this movement, A could capture about 3/4 of the market share. However, B would then move to capture bulk of market (stage 3). Then, A would move again until they move to the market centre (stage 4). Equilibrium would obtain in stage 4 where two firms moved to the market centre and next to each other. They both shared half of the market. It is a stable situation and they are not likely to relocate. However, it is criticized that is not a social optimal situation, since customers have to travel longer distance (maximum 1/2 km) to the market centre.

Hotelling found that firms would cluster on a plane as well as a linear market, even customers were not evenly distributed. He continued to claim when two more sellers enter the market, the theory would still hold good. He suggested the entry of third seller would locate in the market centre and next to the two existing sellers. He also suggested that the theory was providing a logical explanation for standardization of products.

2.3.2 Criticisms and Significance of the Theory

This is the first theory trying to explain clustering of shops selling similar products. It can explain why shops selling homogeneous goods cluster and why the new producers make their products alike the existing products. Boulding (1966) had the following comment on the theory:

"A principle of the utmost generality. It explain why all the dime stores are usually clustered together, often next door to each other; why certain towns attract large numbers of firms of one kind; why industry, such as the garment industry, will concentrate in one quarter of a city. It is a principle which can be carried over into other differences than spatial differences. It explains why all automobiles are so much alike and tend to get even more alike… it explains the importance of brand names in commercial, social, and even religious life… and … it also explains the importance of advertising, for a great part of advertising is little more than an attempt to establish a brand name in the minds of the public" (Boulding, 1966).

Though Hotelling was the first person attempt to explain agglomeration, his theory was challenged by many scholars. Series of researches were done based on his rationale. They relaxed some of the assumptions and applied to the real world

situation. However, they found it could hardly explain the real world.

Most of subsequent criticisms focused the strict assumptions. Hotelling noted that a modification or relaxation of some of the assumptions, for instance, the perfectly inelastic demand, would result in dispersed firms. He again noted that the propensity to cluster depends on transportation cost. When freight rate was high or was met by the sellers, dispersal of firms would be resulted.

Under a more realistic assumptions of fixed location choice and free entry, it pays sellers to increase their number of outlets or products, expand production capacity, or locate sufficiently far apart to deter the entry of competitive firms. A spatially dispersed, social optimum pattern is inevitable (Brown, 1989).

Lerner and Singer (1937) challenged that dispersal pattern would be resulted in the case of competitive pricing. Chamberlin (1933) argued Hotelling's idea that the entry of third seller would not locate next to the firms at centre. He argued the third seller would result in unstable leap-frogging, because seller located in between two sellers would get no market share. They would relocate and attempted to get a prime exterior location where obtaining largest market share. He suggested the three sellers would

locate away from each other. Two sellers located at the quartiles with the third seller locating in between. Moreover, more than three firms and up to 256 have been examined. The result was not in a clustering of firms in the market center. A disperse pattern of paired establishments was resulted instead (Lerner and Singer, 1937). It was termed as 'Principle of Local Clustering'.

Shilnoy (1981) criticized Hotelling's type of agglomeration would only occur where the population was sufficiently concentrated. Ghosh and McLafferty (1987) criticized that the theory also did not explain agglomeration of dissimilar stores within shopping districts. Gannon (1972) showed that sellers' behaviour also matter whether to cluster or not. When sellers took aggressive response to the competitive behaviour of other sellers, or they were in fear of retaliation; they tended to disperse. On the hand, complacent behaviour would encourage clustering.

To conclude, many studies support Eaton and Lipsey (1979) that:

> 'the Hotelling model is not able to explain the local clustering of firms… Indeed, once the assumptions are relaxed very slightly in the direction of realism, Hotelling's model predicts that no two firms should be clustered together.'

2.3.3 Implication of the Theory

Under Hotelling's theory, clustering of shops selling homogeneous products will be found in market centre. This is observed in Hong Kong (examples listed in chapter 3). However, the shops do not necessary locate in a linear market but can agglomerate in a vertical way instead. That means they cluster in the same building and the number of the sellers are much greater than two.

Besides, there are lots of shops selling both homogeneous and heterogeneous products cluster in Hong Kong's shopping centres, which is not explained by Hotelling. Furthermore, Hotelling's theory does not provide sufficient explanation for why the shops either selling similar or dissimilar products cluster.

The theory considers neither sellers' behaviour nor customers' behaviour in determining whether shops cluster or not. However, behavioural consideration is proved to be significant by other studies. To be specific, it does not consider search cost of the customers and sellers. Therefore, Hotelling's theory cannot fully explain Hong Kong situation.

2.4 Search Cost and Agglomeration

Stuart (1979) in his paper stated that search takes place due to the difference in product characteristics and that were valued differently by customers.

Stigler (1961) started with the nature of search in his paper. In his model, prices changed in the market with different frequency. As no one knows all prices quoted by various sellers or buyers, buyer or seller who wishes to find out the most favourable price must canvass various sellers or buyers. This phenomenon is termed as ‘search’.

As there is price dispersion and buyers wants to get the most favourable price, they start to search. Search is not costless. Search cost for a buyer is proportional to the number of sellers approached. Time is the main cost. As each buyer values time differently, time cost varies from buyers to buyers. As a profit maximizer, buyer will not search indefinitely. They stop search when cost of search is equated to expected return. In order words, an optimum amount of search is achieved under the situation where marginal cost of search equals the expected increase in receipts.

He continued his paper on discussing determinants of search. He showed that if the correlation of successive prices is positive, customer search will be largest in the

initial period than in subsequent period (Stigler, 1961).

The correlation of homogeneous product is positive. The amount of search varies among each buyers and sellers, due to the difference in their expenditures on the products and/or search cost. For those sellers who desire to have a continued patronage of the buyers who value gain from search more highly or have lower costs of search, they must receive a lower price. Goodwill is defined as continued patronage by customers without continued search. Reputation denotes the persistence of quality and reputation command a price, because it minimizes search cost.

To summarize Stigler's idea:

1. The larger fraction of buyers' expenditures on a commodity, greater savings from search will be. Hence, there will be greater amount of search.
2. The larger fraction of repetitive buyers in the market, greater effective search will be.
3. The larger fraction of repetitive sellers, higher correlation between successive prices will be resulted. The amount of accumulated search will be greater.
4. The cost of search will be greater, the larger the geographical size of the market.

(Stigler, 1961)

Stigler (1961) developed the concept on searching information for goods and the condition for optimum search. However, his study did not deal with the matter of retail agglomeration. He did not relate search and information cost to retail agglomeration. Nevertheless, his work provides a framework for later studies on retail agglomeration. Series of later studies reveal the correlation between the three concepts (i.e. search, information cost and agglomeration).

Harvesting wisdom from Stigler (1961), Nelson (1970) studied the relationship between information and consumer behaviour. In his study, consumers are lack of full information on product prices and quality. They search for product information and cost. However, cost for getting information on quality is much higher than getting information on prices.

Customers may rely on their own experiences, their friends' experience, consumer magazines, or advertisements, to get product information. Nelson (1970) predicted that stores selling search goods would cluster more than stores that sell experienced goods. The ratio of retail advertising to national advertising will be greater for search goods (Nelson, 1970).

Later studies by Eaton and Lipsey (1979) incorporated the concept of information search and customers behaviours into retail agglomeration. In their paper published in 1979, they revealed that clustering of firms selling homogeneous products will be resulted when there was comparison shopping. Comparison shopping is a shopping behaviour due to customers' desire for searching and comparing among sellers. Eaton and Lipsey's model suggested comparison shopping occur under two circumstances. First, prices and qualities of products are changing rapidly relative to frequency of purchase, so product information gathered at the past become useless. Second, time cost and monetary cost for search/compare are not high relative to expected potential gain from comparison. Stuart (1979) also supported this point. The products cannot be too inexpensive and it should be durable goods and bought infrequently, so that customers would compare during each purchase.

Lösch (1954) was the pioneer suggesting the existence of special business districts to 'the preference of customers for… comparing qualities of differentiated products'(Lösch, 1954). There were plenty of studies proving that comparison shopping do exist and the retailers tended to cluster (Horton, 1968, Rogers, 1965). Stuart (1979) agreed on the same idea of promoting search by firm clustering. Buyers would find search advantageous when goods' heterogeneity is great and cost for

searching and traveling is relatively small. The existence of these market places is efficient, as they promote search by providing buyers with ample sampling opportunities and in effect reduce information costs in the trading of 'search sensitive' (Stuart, 1979).

In Eaton and Lipsey's model, they predicted that no firm can be unpaired and equilibrium will obtain when firms in a grouping of at least two firms. There are no single firms in the market. They will relocate next to their competitors, as the paired firms get more than twice sale volume than a single store. Market boundary between two groups of firms is the midpoint between them, since customers would travel to the nearest group for saving transport cost when all firms exist in a group of paired firms.

The model suggested that in social optimal situation, firms should group in pairs and locate at the center of markets. By doing so, buyers can minimize total transport cost. In this situation, customers can always visit at least two firms at the same time, so they can minimize transport cost by traveling minimum distance to the nearest market centre where are paired firms.

Later studies inherited the idea that firm clustering/agglomeration was due to intention to reduce information cost. Wolinsky (1983) developed a model of firm clustering with assumption of imperfect customer information. In his model, customers either went to a single seller or a cluster to shop, but they avoided going to both. For this reason, they tended to go to the cluster rather than a single shop for economizing transport cost.

Moreover, they had higher opportunity to get suitable goods in a cluster. Therefore, they had lower opportunity to extend further search from other sellers. The model proved that when the area is not excessively large and a cluster already exists, then each store can expect more business and higher profits a cluster (Wolinsky, 1983). This provides the same idea as Eaton and Lipsey (1979).

Both Eaton and Lipsey (1979) and Wolinsky (1983) pointed out that firm clustering were capable to increase sale volume. It is because more customers would come to the cluster for comparison shopping. However, they both failed to emphasize the effect on prices due to keen competition among sellers. Konishi (2005) filled the gap by developing a model on balancing the market size effect and price cutting effect.

In Konishi's paper (2005), he assumed customers did not know the exact tastes over commodities and they distributed over the plane. Each of them buys only at most one unit of a commodity at a shopping centre, and their total cost is the sum of commuting cost and commodity price. Stores tended to cluster for providing larger variety of goods, so it attracts more customers. As a result, market size increased which was so-called 'market size effect'. At the same time, fiercer price competition of clustering firms led to price cut. It is so-called 'price cutting effect'. His paper focused on the trade-off between these two effects. He illustrated the idea by three stages.

In stage 1 of his model, sellers needed to decide firm locations from the set of shopping markets. Consumers observed stores' location, but yet to know neither their willingness to pay for nor prices of commodities before actually visit. They decided which centre to visit by calculating expected utility of searching and commuting costs for visiting each market. In stage 2, it was assumed that customers would visit one centre only. Once they arrived the market, commuting cost became sunk cost. They bought the commodity gave them highest surplus (i.e. willingness to pay minus price of commodity). They would buy nothing if there were no surplus. Because of this shopping behaviour, stores needed to compete in price (stage 3). If consumer's willingness-to-pay distributions over different commodities are not perfectly

correlated, concentration of stores at a shopping area increase the expected utility from visiting there. It implies that customers living far away may visit the shopping centre, so the market area expanded (Konishi, 2005). As stores clustered and desired to capture as many customers as possible, they competed by cutting prices. This sent a signal to customers that clustering of stores in market area does not only minimize search cost but also can enjoy a lower price.

He illustrated the idea by an example. When a customer wanted to buy a car but she did not know how much she liked each of cars before. If she visited one car seller, the probability that she liked the car and purchase was $\frac{1}{4}$ (i.e. 25%). On the other hand, the probability of not to buy was $\frac{3}{4}$ (i.e. 75%). If she visited a centre with two sellers, (e.g. BMW and Volvo) the probability of purchasing a car increased to $\frac{7}{16}$ (i.e. 43.7%). Because the probability of not to purchase from each seller was $\frac{3}{4}$ (i.e. 75%), so the probability of not to purchase from the two sellers decreased to $\frac{3}{4} \times \frac{3}{4}$ = $\frac{9}{16}$ (i.e. 56.3%). If there were five sellers, the probability that she could find the favourable car was $1 - (\frac{3}{4})^5$ = 76.3%. As a result, clustering can increase market size due to reducing tastes uncertainty.

2.4.1 Implication of the Theories

Imperfect information is the key factor motivating customers to search. They compare expected benefit from search with search cost (i.e. transport cost plus time cost). The theories support that customers would search and compare between stores, as long as the expected benefit from search greater than search cost. Eaton and Lipsey (1979), Wolinsky (1983) and Konishi (2005) proved that clustering can increase sale volume and market size, so it motivates firms to agglomerate.

In Hong Kong, there are plenty of retail agglomeration, either in homogeneous products or heterogeneous products. In this dissertation, clustering of audio shops was observed in Mong Kok. There are other examples of homogeneous agglomeration, such as florist shops in Prince Edward, audio shops in Sham Shui Po (Apliu Street), computer shops in Sham Shui Po (Golden Computer Centre), dried seafood shops in Sheung Wan, etc. Saving information cost provides theoretic explanation for this clustering phenomenon.

Chapter 3

Agglomeration in Hong Kong

3.1 Introduction

Retail sector is one of major sectors in Hong Kong economy. According to Census and Statistics Department, retail sector contributed HK$273,000 million to Hong Kong economy in 2008 (refers to Appendix 1). It keeps on flourishing due to launching of "Individual Visit Scheme" in 2003. Mainland residents can visit Hong Kong in an individual basis.

Shopping places exist in several forms, varying from hawkers, street level shops, wet markets, special bazaars (e.g. Woman Street and Stanley Market), department stores, shopping malls, shopping centres to upstairs shops. Shops selling similar or homogeneous goods can be found in many places. For example, London has Bond Street and Petticoat Lane while New York has jewellery dealers on 47th Street (Simmons and Chan, 1992).

In this chapter, examples of homogeneous retail agglomeration in Hong Kong will be gone through for figuring out the real situation.

3.2 Agglomeration Examples

There are cases of retail agglomeration in Hong Kong. As mentioned before, agglomeration can exist either in form of heterogeneous or homogeneous.

Shopping malls, shopping centres and special bazaars (e.g. Woman Street) are typical examples of heterogeneous agglomeration, where retailers selling different products cluster at a single market place. The existence of this kind of agglomeration is due to purchasers' multi-purpose shopping behaviour, which means that purchasers come to a single place to buy several kinds of products. However, this kind of agglomeration is not the focus in this dissertation.

On the other hand, retailers selling similar or homogeneous products are also found in the market. Examples are listed in table 3.1 and 3.2. The reasons for this pattern are the desire to reduce search cost and enjoy agglomeration benefits which be discussed in detail in chapter 4. Homogeneous agglomeration can exist in horizontal level and vertical level. Agglomeration in horizontal level means shops agglomerate on the same street, such as examples in table 3.1. While agglomeration in vertical level means shops agglomerate at the same building, examples are listed in table 3.2. The main difference between them is the direction of agglomeration, but the underlying

reasons for agglomeration are the same. Retailers agglomerate in vertical level and they locate in the so-called ‘upstairs stores’.

The upstairs stores retailers tend to cluster more, as their exposures are smaller than the street level shops. Customers can hardly find an individual upstairs store. Therefore, the upstairs stores selling homogeneous products tend to agglomerate at the same building. This does not only create advertising effect (will be discussed in subsection 4.3) attracting more customers, but also enlarge their market size (will be discussed in subsection 4.2).

The below tables give summary of homogeneous agglomeration cases in Hong Kong.

Horizontal Agglomeration (agglomerate on street level)		
District	**Name of Street**	**Type of Business**
Sheung Wan	Des Voeux Road West	Dried seafood
Sheung Wan	Ko Shing Street	Herbal medicine
Sheung Wan	Wing Lok Street & Bonham Strand West	Ginseng Bird's nest
Sheung Wan	Hollywood Road Upper Lascar Road / Cat Street	Chinese antiques Jades Silk products Wooden handicraft items
Central	Li Yuen Street East & West	Garments
Wan Chai	Tai Yuen Street	Toys
Yau Ma Tei	Junction of Kansu & Battery streets	Jades
Yau Ma Tei	Canton Road between Kansu Street & Jordan Road	Jades
Mong Kok	Fa Yuen Street	Sportswears
Mong Kok	Tung Choi Street	Aquariums
Mong Kok	Yuen Po Street	Songbirds
Mong Kok	Flower Market Road	Flowers
Sham Shui Po	Apliu Street	Electrical devices Electronic products

Sham Shui Po	Cheung Sha Wan Road	Garments

Table 3.1 Summary of homogeneous agglomeration on street level

Vertical agglomeration (agglomerate within a building)		
District	**Name of building**	**Type of Business**
Mong Kok	Dundas Centre	Cafés
Mong Kok	Heng Lung Building	Cafés
Mong Kok	Wah Mei Building	Cafés
Mong Kok	Kelly Commercial Building	Cafés
Mong Kok	Mong Kok Centre	Medical service
Mong Kok	King Wah Centre	Garments
Mong Kok	Bank Centre	Travel agents
Mong Kok	Grandcastle Commercial Building	Audio equipment
Mong Kok	Yau Shing Commercial Centre	Audio equipment

Table 3.2 Summary of homogeneous agglomeration on vertical level in Mong Kok

Chapter 4

Hypothesis

4.1 Introduction

To develop thesis statement, we have to understand relationship between imperfect information, search cost, consumer behaviours and agglomeration of homogeneous product sellers. After that, agglomeration benefits will be discussed with support of past researches.

It is believe that agglomeration benefits should be reflected in the value of retail property. Therefore, thesis statement is developed.

4.2 Imperfect Information, Search and Agglomeration

Most scholars agreed that uncertainty about product information, search cost and agglomeration are in a cause-effect relationship (Brown, 1992; Nelson, 1970 and Wolinsky, 1983). Due to imperfect product information, customers know little about prices and qualities. They need to search and compare between different sellers, so search cost arises which can be expressed in terms of time and monetary cost (e.g. transport cost). Comparison shopping is the term describing this consumer shopping behaviour (Eaton and Lipsey, 1979 and Lösch, 1954).

Comparison shopping and imperfect information encourage retailers to cluster (Eaton and Lipsey, 1979 and Wolinsky 1983). Therefore, agglomeration is the outcome of imperfect information and search behaviours (comparison shopping). Besides, retailers are enjoying agglomeration benefits that will be discussed below.

4.3 Agglomeration Benefit - Market Size

Understanding customer behaviours, sellers tend to cluster and locate near to each other. Agglomeration is the phenomenon in response to reduce search cost (Brown, 1992; Eaton and Lipsey, 1979; Nelson, 1970 and Wolinsky, 1983). Obviously, sellers do not aim at reducing customers' search cost, but to maximize their benefits (i.e. increase their profit). With the support of past researches (Eaton and Lipsey, 1979; Konishi, 2005 and Wolinsky, 1983), agglomeration of firms leads to an increase in sale volume and market size. Though price cut may also result, Konishi (2005) revealed that market size effect overrode price cut effect. Therefore, sellers tended to cluster for getting a larger market size and enjoying a larger sale volume.

4.4 Agglomeration Benefit - Advertising

Apart from getting larger market size, agglomeration also can be regarded as an advertising and promotion mean (Brown, 1992). Advertising fills the information gap.

It provides product information, as well as knowledge of identity of sellers, to the customers. With reference to the paper of Stigler (1961), advertising is the method of identifying buyers and sellers. The classified advertisements in particular form a meeting place for potential buyers and sellers. The identification of buyers and sellers reduces search cost. Usually, it will be devoted to those products with high marginal value for searching. The economies of disseminating information is great for joint promotion (Stigler, 1961).

How does agglomeration of homogeneous product sellers as a mean of advertising? This can be done through two aspects.

Firstly, agglomeration of firms selling homogeneous product gives a signal to customers that they have a greater probability to get products, which giving them the highest utility (Konishi, 2005). It is because they can compare among sellers at the same place/market, so search cost can be reduced. Therefore, it provides a signal to the customers that shopping at the cluster can reduce search cost and they are able to get the right product. In Konishi's paper, he illustrated this point by using an example of buying cars in a market with different number of sellers. He calculated the probability to purchase a right car. He revealed that the probability to purchase

increases as the number of sellers in the same market increases (have been discussed in section 2.4.1).

Secondly, Konishi (2005) revealed that price cut is resulted in firm clustering due to keen competition. Customers have a signal of getting less expensive products in the cluster. Therefore, customers are more willing to go to the cluster, especially for those who know little about the product. For example, when a layman desire to purchase a new TV set, he tends to visit the centre where many TV sellers cluster, rather than visits a single seller somewhere. This psychological image of price cut conveys to the public and attracts shoppers to come to the cluster.

Therefore, when these two factors add together, reputation in a cluster is grown. It attracts more customers to the cluster, so it is desirable for retailers in cluster.

4.5 Agglomeration Benefit – Presence of Existing Market

If product is a consumer good, clustering of sellers gives message to the new seller that the market for the product is ready exist (Beckmann, 1999). When the seller decides to enter the market, they would consider whether there is market for his product, the existing clustering can give them a signal that there is a market, facilities

and advertising effect are already there. This can reduce new seller's uncertainty about the customers, as well as the market.

4.6 Thesis Statement

Because of the agglomeration benefits, sellers are keen to cluster. They compete for the location where agglomeration exists, so they bid up the price of shops. Therefore, it is suspected that the value of retail stores should reflect this agglomeration benefit. The thesis statement is:

> *"Clustering of homogeneous product sellers in a building enhances retail property value"*

Chapter 5

Source of Data

5.1 Introduction

In this chapter, the purpose is to provide a detailed description to the reader about data source. Therefore, the following questions should be considered. Firstly, where is the targeted district and why? Secondly, where are the targeted buildings? Thirdly, how does the data being collected and how is the data reliability?

5.2 Targeted District

Mong Kok is the targeted district in this dissertation. Not only because Mong Kok is one of the earliest developed shopping areas, but also is one of the most desirable location for retailers and shopping areas for customers. This is supported the survey conducted by the Planning Department in 2004.

Retailers' side

The survey shows that retailers recognized the following factors determining their locations.

- heavy pedestrian flow (42.3%);
- premises located in major shopping area (13.3%);
- convenient transportation nearby (9.5%);
- presence of many stores of the same type nearby (7.0%) and;
- large population living nearby (6.7%)

Mong Kok satisfies the above conditions, as it is one of the areas with high pedestrian flow and one of the major shopping areas. Mong Kok is highly accessible, where served by mass transit railways and buses. Furthermore, there are pedestrian prioritized zones, so it attracts huge amount of pedestrian flow. High accessibility with large pedestrian flow, so Mong Kok is a desirable location for retailers.

One point to note, retailers consider "presence of many stores of the same type nearby" as a criteria for their location choice. This shows that retailers would prefer agglomeration as a favourable factor for their location. The reasons behind are due to the agglomeration benefits, which have been discussed in last chapter.

Customers' side

Apart from retailers' side, customers' survey reveals that Mongkok is their favourite shopping district.

1. Household purchase durable goods

   - Households that had purchased household durable goods in the six months prior to date of interview,

     27.5% patronized stores in Mong Kok,
     14.3% Causeway Bay,
     7.9% Shatin,
     6.6% Tsuen Wan,
     5.1% Wan Chai,
     4.4% Sham Shui Po, and
     4.0% Kowloon Bay.

   - Main reasons:

     there was a wide variety of goods for choice in that district (77.2%),
     low prices of goods in that district (10.2%).

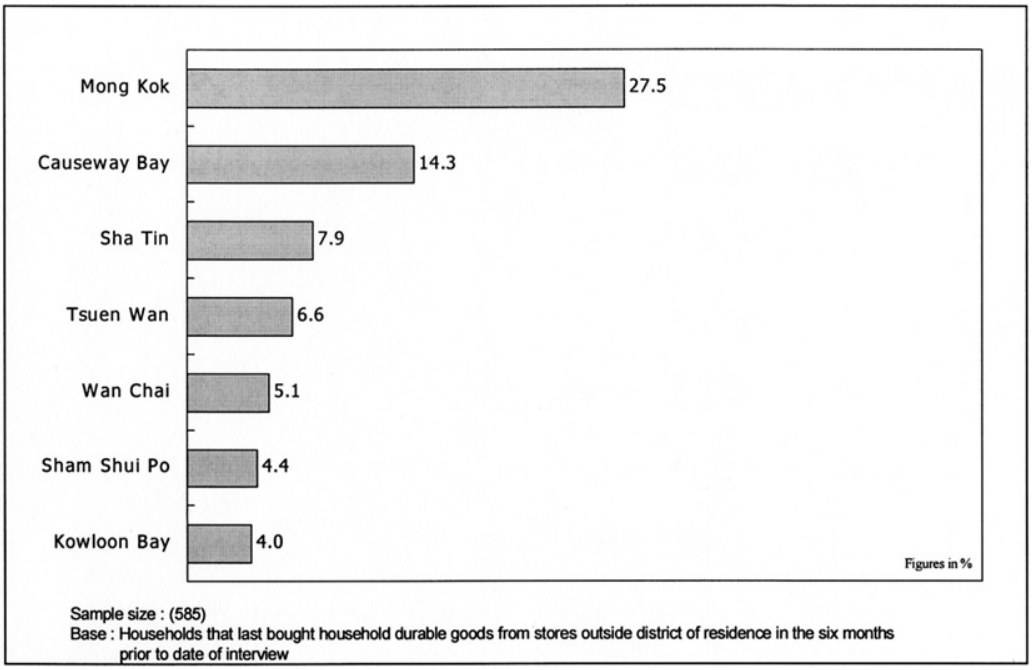

Fig. 5.1 District where household durable goods were bought from stores outside district of residence last time (the most popular district by rank)

2. Persons who had consumed clothing, footwear and allied products

- Three most popular districts for purchasing these products were

  Mong Kok (39.1%),
  Causeway Bay (19.8%) and
  Tsim Sha Tsui (11.2%)

- Main reasons:

  there was a wide variety of goods in that district (81.2%),
  they worked in that district (9.2%) and
  low prices of goods in that district (4.7%)

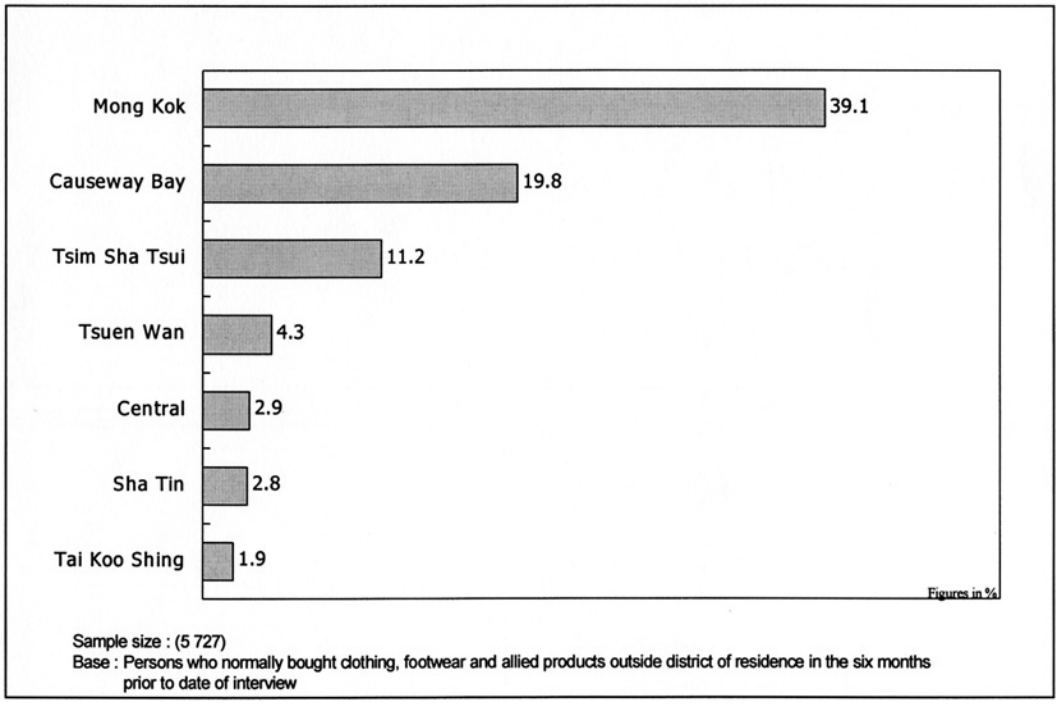

Fig. 5.2 District where clothing, footwear and allied products were normally bought outside district of residence (the most popular district by rank)

3. Persons who had consumed personal consumer goods

- Three most popular districts for purchasing these products were

  Mong Kok (32.8%),
  Causeway Bay (23.4%) and
  Tsim Sha Tsui (12.0%)

- Main reasons:

  there was a wide variety of goods in that district (74.7%) and
  they worked in that district (17.1%).

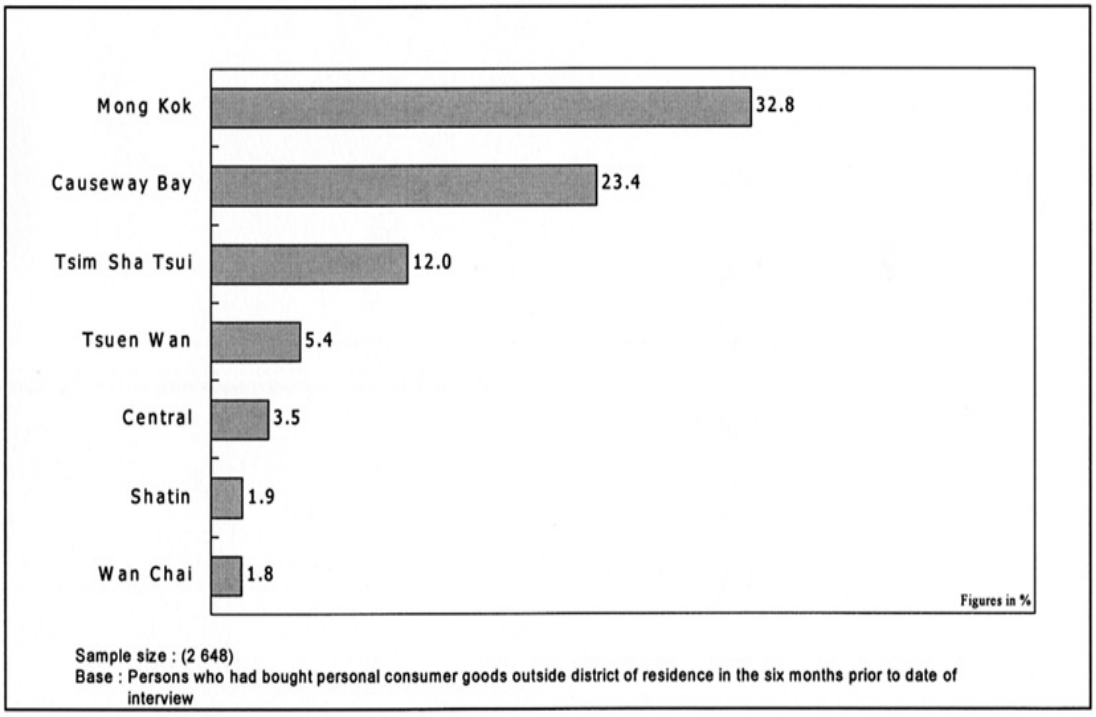

Fig. 5.3 District where personal consumer goods were normally bought outside district of residence (the most popular district by rank)

4. Persons who had consumed personal durable goods

- Two most popular districts were

  Mong Kok (50.7%) and
  Causeway Bay (17.6%).

- Main reason:

  there was a wide variety of goods in that district (84.8%)

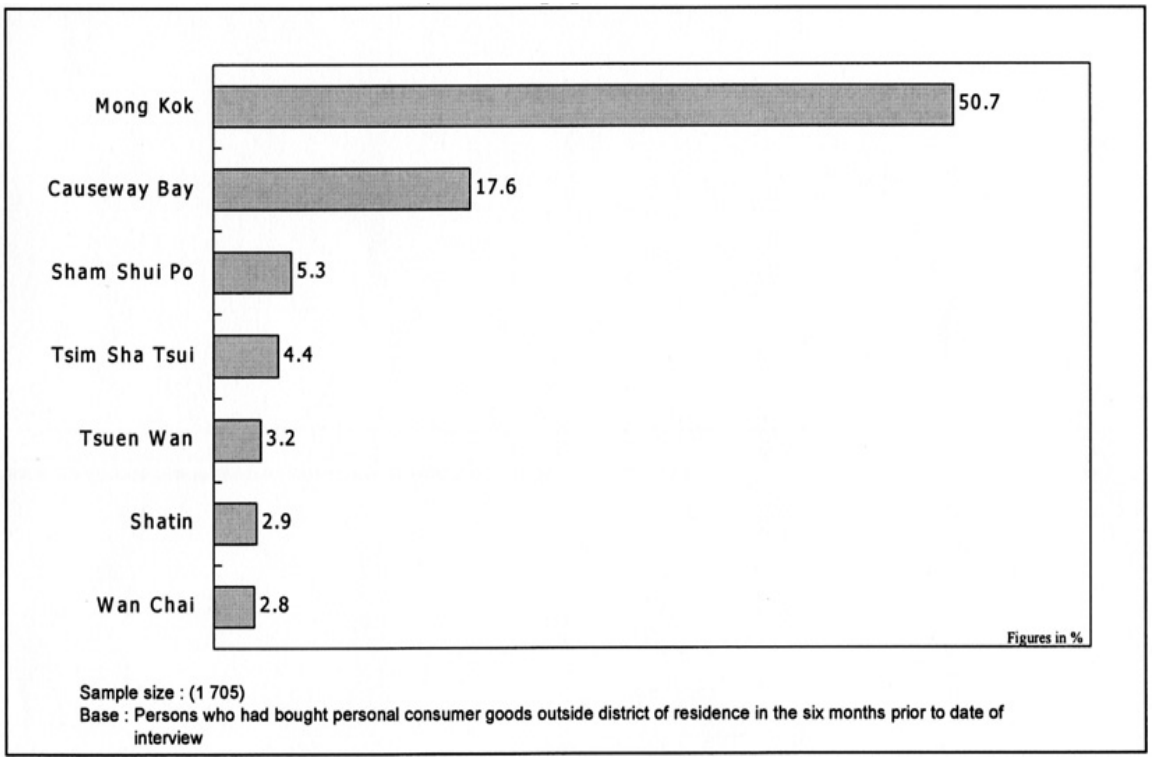

Fig. 5.4 District where personal durable goods were bought outside district of residence last time (the most popular district by rank)

5. Persons who had consumed personal services

- three most popular districts where people consumed "hairdressing services"

  Causeway Bay (14.6%),
  Mong Kok (13.9%) and
  Tsim Sha Tsui (13.0%).

- those who normally consumed "medical / dental consultation services", those districts with more mentions

  Mong Kok (11.2%),
  Tsuen Wan (7.5%),
  Central (7.1%),
  Aberdeen (7.0%), and
  Causeway Bay (6.8%).

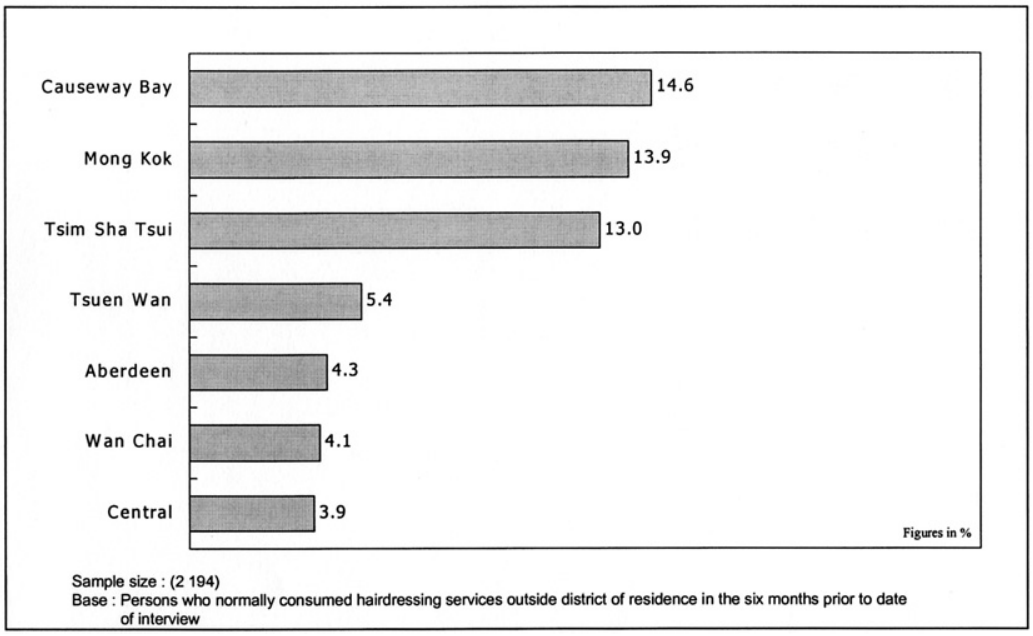

Fig.5.5 District where hairdressing services were normally consumed outside district of residence (the most popular district by rank)

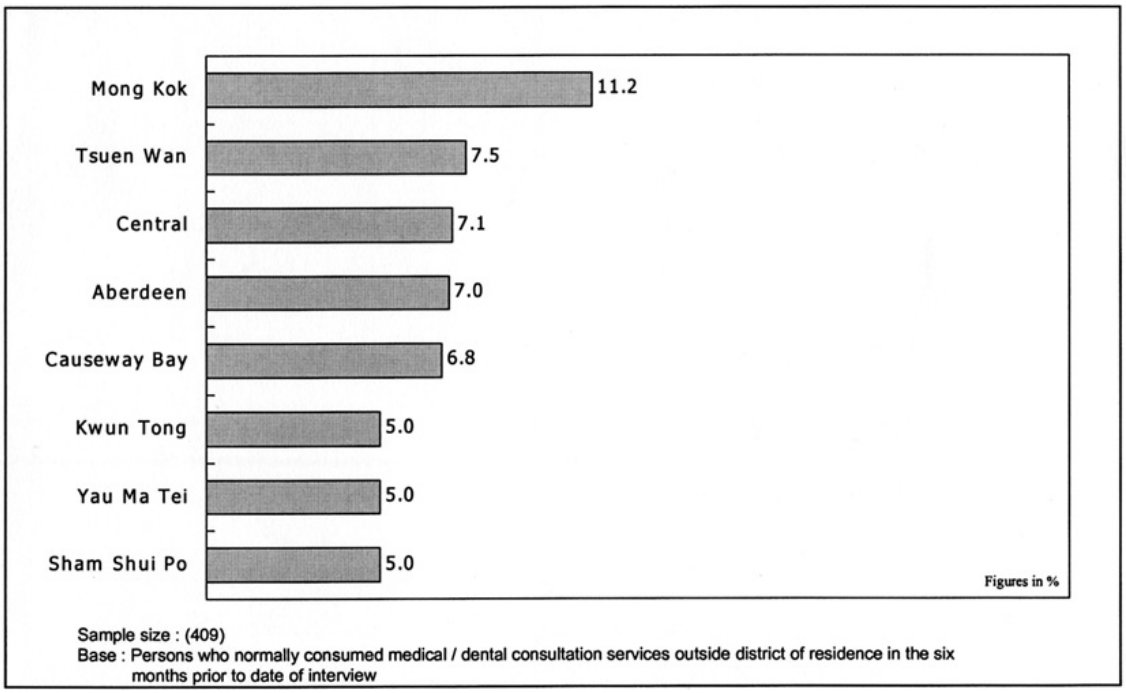

Fig.5.6 District where medical / dental consultation services were normally consumed outside district of residence (the most popular district by rank)

6. Persons who had consumed services related to leisure and entertainment

- Three most popular districts where people went to "cinemas" and "karaoke lounges"

  Mong Kok (34.2% and 48.3% respectively),
  Causeway Bay (22.2% and 24.0% respectively) and
  Tsim Sha Tsui (8.9% and 15.8% respectively).

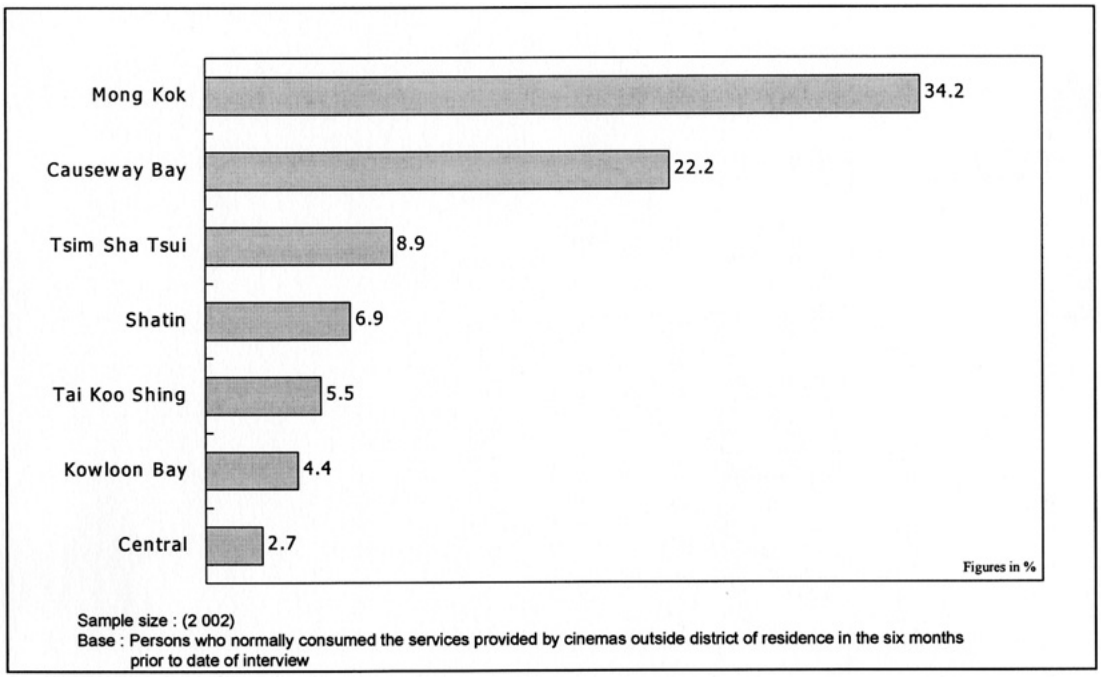

Fig. 5.7 District where services provided by cinemas were normally consumed outside district of residence

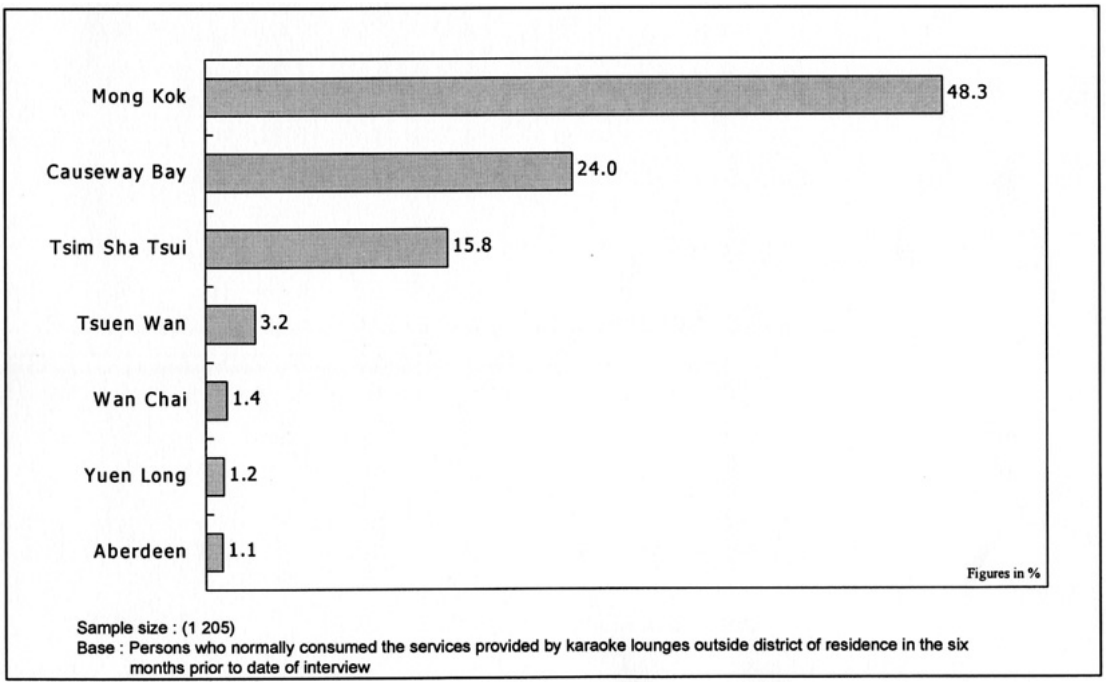

Fig. 5.8 District where services provided by karaoke lounges were normally consumed outside district of residence

According to Planning Department customers' survey, Mong Kok is the most popular shopping area compared with other shopping districts. They visited Mong Kok most frequently for purchasing household durable goods; clothing, footwear and allied products; personal consumer goods; personal durable goods; medical / dental consultation services; and leisure and entertainment. Mong Kok is their first choice to get the goods or services, although more customers preferred going to Causeway Bay for having hairdressing services. A wide variety of goods and lower price is the main reason for customers to shop at Mong Kok.

To conclude, Mong Kok is the most desirable location for both retailer and customers. It is the typical and representative example for retail research in Hong Kong.

5.3 Targeted Buildings

In this dissertation, it focuses on four targeted commercial buildings in Mong Kok. They are both located in Sai Yeung Choi Street South (between Argyle Street and Dundas Street) which is a pedestrian prioritized area. It is a part time pedestrian street and vehicular access is only allowed in specific periods. Figure 5.9 shows the pedestrian streets in Mong Kok and the area inside the red circle is Sai Yeung Choi Street South. Figure 5.10 shows the location of the targeted buildings.

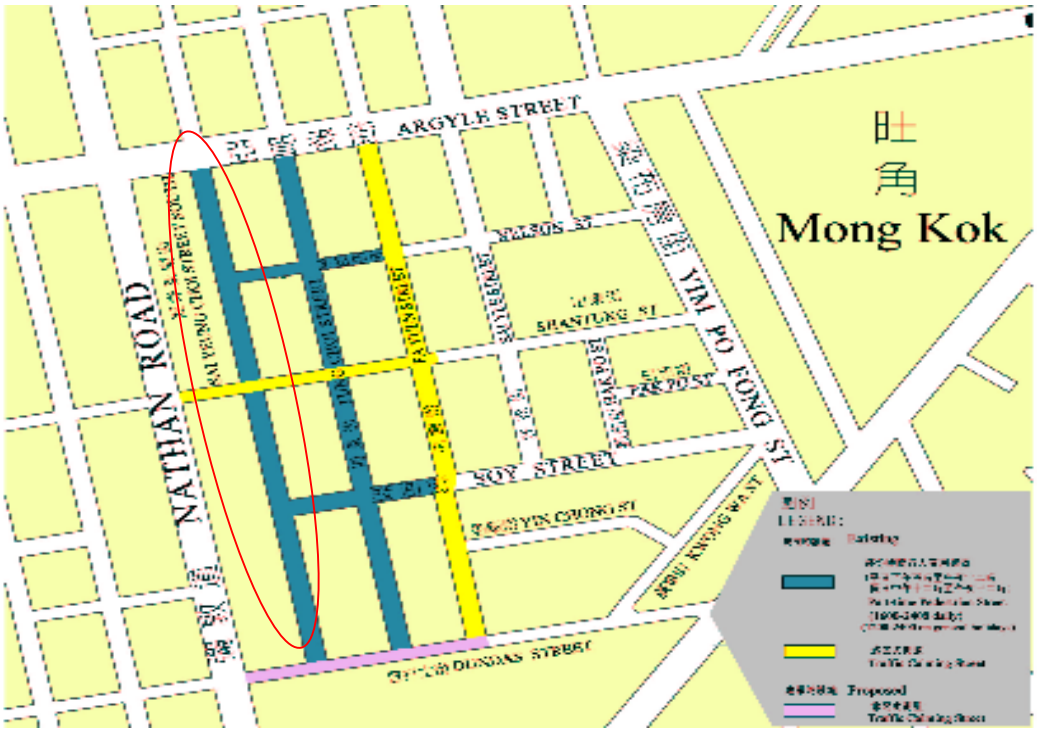

Fig. 5.9 Map shows pedestrian streets in Mong Kok
Source: Transport Department

No.	Name of building	Age	Agglomeration	Use
1	Mong Kok City Centre	40	No (mix of different retailing uses)	Commercial
2	Yau Shing Commercial Centre	36	Yes (clustering of audio retailers)	Commercial
3	Grandcastle Commercial Building	17	Yes (clustering of audio retailers)	Commercial
4	Good Hope Building	38	No (mix of different retailing uses)	Commercial

Table 5.1 Details of the targeted buildings

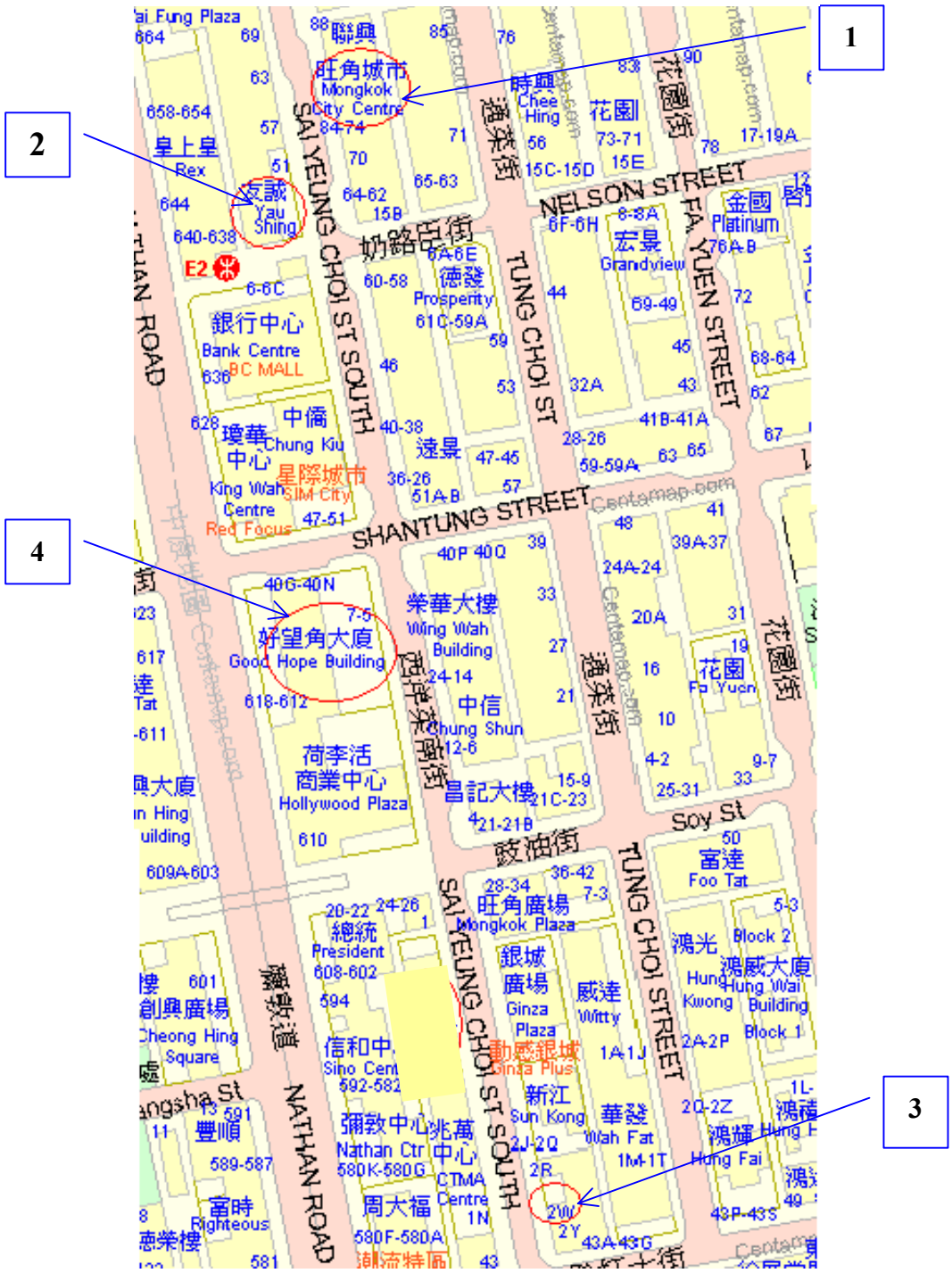

Fig. 5.10 Map shows location of the targeted buildings

Source: Centamap

The buildings are located near to each other. They both located in Sai Yeung Choi Street South, so location effect can be minimized. Two buildings (i.e. Mong Kok City Centre and Good Hope Building) are mixed with retailers selling different goods or services, so there is no agglomeration or to be specific, they are not as agglomerated as the other two buildings. In contrast, Yau Shing Commercial Centre and Grandcastle Commercial Building both have over 70% of the total unit selling homogeneous products, i.e. audio sets and equipment. To be specific, there are over 90% of shops selling audio sets and equipment in Grandcastle Commercial Building.

5.4 Rateable Value

The main channels for getting property price data were either through Economic Property Research Centre (EPRC), the Centaline or the property agency companies. However, retail property transaction is not frequent and not all transactions were reported. It makes access of information difficult, so hinders research on retail properties. As Hui, Yiu and Yau (2007) commented that rental analysis of retail properties is often hampered with the lack of rental data. Mostly due to the non-disclosure of relevant information among privately-owned retail properties. Using rateable value can overcome the problems, as it provides comprehensive data for each property

In this dissertation, rateable value will be used for analyzing the retail properties. They are obtainable from Rating and Valuation Department website in May each year.

According to Rating and Valuation Department, rateable value is an estimate of annual rental value of the property at a designated valuation reference date, assuming that the property was vacant and to be let out. For 2008-09 rateable value, the designated reference date is 1 October 2007.

In other words, rateable value is reflecting the estimated annual rental value in an open market. The rent to be estimated is such a rent as might reasonably be expected for the tenement if let “from year to year”. The law is well settled that a yearly tenancy implies a reasonable expectation of its continuance (Pang, 2006).

Rating and Valuation Department will assess the value base on certain assumptions and consider the following factors, such as age, size, floor level, quality of finishes, location, transport facilities and amenities, etc. Moreover, unauthorized illegal structure will also be assessed into the value. As Rating and Valuation Department states that rates are a tax on occupation, and any property which can be separately occupied is liable to assessment, regardless of whether or not the structure is

authorized.

Rating and Valuation Department ascertains rateable value by market rental value of the tenement. In section 7 of the Rating Ordinance, market value is ascertained on the basis of two statutory assumptions: 1) the tenant is liable for rates and taxes and 2) the landlord is liable for government rent, repairs, insurance and maintenance.

The application of open market rents means that test is objective. Rateable value is based on the rent a hypothetical tenant, freely negotiating in the market, would, in accordance with market rents, agree to for the particular tenement. However, actual rent of the particular tenement being assessed is relevant in ascertaining the objective hypothetical rent which constitutes the rateable value. The weight that will be given to the actual rent will depend on the extent to which, after considering other comparables, the actual rent accords with the market rent (Pang, 2006).

Section 7 stated that it would be assessed in a year and year basis. Tone of the list was introduced in Hong Kong's rating law in 1973. The introduction of tone of the list means that ratepayers are responsible for unfair proportion of the rates burden. It is due to the interim valuations of newly assessed properties being valued at a current

date, rather than a common date. As a result, value in a rising market being above the tone of the list. Pang (2006) concluded that the general level of value prevailing at the date when the existing valuation list was prepared.

Rateable value also follows the Rebus Sic Stantibus Principle. The rule had been developed by common law. It required valuation to be assessed at the relevant date in the basis of its actual use and in relation to the existing circumstances. In other words, vacant land at the relevant date was valued as a vacant land, the residential land was valued as a residential land, etc. In section 7 and 7(A), which states that "subsisting mode or character of occupation", it means that the tenement is valued in accordance with the actual use or any other use within that same mode or character. Alternative use which can potentially generating a higher rent is not put into consideration for valuation.

The other rule for valuation is that it should be assessed with reference to the value as at a designated date, which is known as "relevant date". Any changes in value after the relevant date is not relevant. In practice, the relevant date is 1 October of every year.

Section 7 and 7(A) also pointed out that each tenement is valued individually. Their individual idiosyncrasies of particular tenement is taken into account for each individual tenement.

There is no statutory requirement on the use of valuation methods for assessing rateable value. The nature of the tenement affects which method to be used. Rental comparison method, receipts and expenditure method and contractor's method are commonly used in Hong Kong. However, the choice of method is not always clear. It is always the case that a second method is used to test the result of initial valuation where appropriate data is available for this purpose. (Pang, 2006) It commonly adopts elemental approach for certain types of tenement, i.e. using different methods for different parts of the tenement.

To sum up, using rateable value provides a reliable data source for retail property analysis as it reflects market values and provides comprehensive data for all properties in Hong Kong. Moreover, rateable value is valued based on the same period of time, i.e. 1 October of the year. Therefore, time effect of property value can be eliminated.

5.5 Other Data of Properties

Apart from rateable value, other data related to the targeted buildings, such as building age, agglomeration, floor level and distance to Mong Kok MTR. They are collected through site visit, surfing Centamap website and visiting Buildings Department and Rating and Valuation Department.

Property information, such as information of tenant mix and types of business were collected through site visit.

Unit sizes and floor levels of each building were obtained from building plans which were acquired from Buildings Department. For the building age, Rating and Valuation Department's publication 'Names of Building' provides a reliable source for building ages and names. Centamap was used to measure the distance to Mong Kok MTR station.

Chapter 6

Methodology and Model

6.1 Introduction

In this chapter, the focus is on how to conduct this research and how to construct the equation. To have basic understanding on hedonic price model and its application, literature on it is reviewed. After discussing the elements/components of constructing a model (ordinary least square method, functional forms and independent variables), an equation is constructed.

6.2 Hedonic Model

Hedonic price model is employed in this dissertation. It has been used in property researches since 1970s. Hedonic regression analysis is a statistical technique which can be applied to a series of property values, together with their associated characteristic, to identify and quantify the significant determinants of value (Dunse and Jones, 1998).

Rosen (1974) defined hedonic price model as:

> 'hedonic prices are defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific

amounts of characteristics associated with them.'

Rosen (1974) believed housing was a trait related to utility of the customers. Price of the goods in different quality is actually a function of levels of its characteristics. In other words, explicit property prices reflect property's implicit attributes and characteristics. Coefficients are hedonic prices reflecting prices for these attributes and characteristics. Buying a property unit is actually consuming a bundle of attributes. Each attributes contribute to the value of a property which is indivisible. In other words, the attributes together add value to an individual property unit and we must consume whole attributes of a property, all-or-nothing.

Real estate is heterogeneous in nature. There is no identical property in the market. However, using hedonic model prices of differentiated goods on quantities of characteristics can be regressed. With information on property prices and attributes, implicit prices of each attributes can be derived by employing regression analysis. Hedonic prices and each attributes' extent of influence on property price can be obtained. This model is commonly used for residential property valuation in the USA. There are series of researches on property, such as housing, office and retail making use of hedonic model (Chau, Pretorious and Yu, 2000; Clapp, 1980; Dunse and Jones,

1998; Hough and Kratz, 1983).

6.3 The Model

6.3.1 Introduction

The model is designed to test hypothesis, i.e. whether agglomeration of homogeneous retail stores add value to retail property price.

In section 5.2, has already explained the reason for choosing Mong Kok as the targeted district and section 5.3 explains the reason for choosing the targeted buildings. The targeted buildings are located at Sai Yeung Choi Street South between Argyle Street and Dundas Street. Location effect can be minimized, because they are concentrated on the same street and located near to each other.

Section 5.4 gives a detailed description on rateable value and its main advantage is to eliminate time effect on property value. As a result, location effect is minimized and time effect is eliminated. The analysis is more reliable.

In this section, procedures of constructing an equation are shown. It is constructed after studying plenty amount of literatures.

6.3.2 Ordinary Least Squares

Ordinary least squares (OLS) is an estimated technique to obtain numerical values for the coefficients of an equation, so as to minimize the sum of squared residuals. Residuals are the distances of actual data points from the estimated data points that lying on the estimated regression line (Eastman, 1984).

OLS is the most popular estimator, so it is usually the first estimator examined. OLS fulfills all requirements in classical linear regression model. The model assumes the expected value of error term is zero which have a constant variance and are uncorrelated with each other. The dependent variable is in a linear function with independent variables plus a stochastic error term. Furthermore, there is no multicollinearity, i.e. no relationship between independent variables.

6.3.3 Functional Forms

Choosing an appropriate form of the relationship between each independent variable and dependent variable is crucial. We need to think whether the equation goes through the origin and whether it is a curve or a straight line? A correct functional form is critical, since an incorrect form will lead to a correct explanatory variable may appear to be insignificant or to have opposite sign (Studenmund, 2006).

It is important to distinguish the difference between an equation which is linear in coefficients and linear in variables. They mean differently. For an equation is non-linear in variables, it should appear like equation 1. While the equation is linear in variables, it should appear like equation 2.

Equation 1: $Y = a_0 + a_1 X + a_2 W^2 + \varepsilon$

Equation 2: $Y = a_0 + a_1 X + a_2 W + \varepsilon$

Equation 3: $Y = a_0 + X^{a_1} + \varepsilon$

For the equation is linear in the coefficients which the coefficients appear in their simplest form, it appears like equation 2. That is they are not multiplied or divided by other coefficients, and do not include any sort of function, such as logs. For the equation is non-linear in coefficients, it appears like equation 3.

Though linear regression assumes linear coefficients, the variables need not to be in linear. Linear regression can be applied to an equation with non-linear variables, if the equation can be formulated in a way that is linear in coefficient. In econometrics, “linear regression” means “regression that is linear in the coefficients” (Studenmund, 2006). The use of OLS requires that the coefficients are in linear. However, other functional forms that are linear in the coefficients while is non-linear in variables.

The key issue is how to choose an appropriate form. It should based on the underlying economic or business theory. The logical form of the relationship between dependent variables and independent variables should be compared with the properties of various functional forms. The one is the closest to the underlying theory is chosen.

1) Linear Form

Linear form is the most common form being used. When the relationship between X (independent variable) and Y (dependent variable) that is the slope is hypothesized to be constant, linear form is appropriate. The elasticity of Y ($\frac{\Delta Y / Y}{\Delta X / X}$) with respect to X means the percentage change in X (dependent variable) caused by 1 percentage increase in Y (independent variable). This form should be used, unless there is strong evidence that the relationship is not linear.

2) Double-Log Form

Double log form is known as 'log-log form'. It is commonly used by researchers, too. It is used when there is non-linear in variables, but there is still linear in coefficients. It should appear like that:

$$InY = a_0 + a_1 In X + a_2 In W + \varepsilon$$

"In" means taking natural logarithm. For log-log form, elasticity is constant and the

slope is not. To interpret *X* in a log-log form is that when *X* increased by 1 percent, *Y* will change by a_1 percent, holding other independent variables constant.

Before using log-log form, it is required to check there are no negative or zero observation in the data. As log of a negative number is undefined, so a regression cannot be ran. For the dummy variables which appear in either 1 or 0, cannot be logged but it can still remain in the equation.

3) Semi-Log Form

Semi-log form is a variant of log-log form. It is used when some but not all the variables are expressed in natural log. It should appear like either in equation 1 or 2:

Equation 1: $Y = a_0 + a_1 In X + a_2 W + \varepsilon$

Equation 2: $InY = a_0 + a_1 X + a_2 W + \varepsilon$

In this form, not all variables are logged. For equation 1, it means that the two slope coefficients are different. *W* is linear related to *Y*, while *X* is non-linear related to *Y*. When it is hypothesized the relationship between X and Y is "increasing at a decreasing rate", semi-log form should be used.

For equation 2, there is neither constant slope nor constant elasticity. It means that when X increases by one unit, then Y change by a percentage of ($a_1 \times 100$), holding a_2 constant.

4) Polynomial Form

When the slope of a relationship is expected to depend on the level of variable itself (for example, change sign as output increase), then a polynomial form should be considered. It is expressed Y as a function of independent variables, some of which are raised to powers other than one.

A polynomial form equation appears like that:

$$Y = a_0 + a_1 X + a_2 X^2 + \varepsilon$$

To conclude, the usual practice to determine the appropriate form is either by 1) prior knowledge on the relationship between independent and dependent variables and determined by logical deduction or 2) trial and error. Try linear first and then try other forms, such as log form and polynomial form.

Semi-log form is employed in this dissertation. It is the result by trial and error which gives the most reasonable model. It is hypothesized some independent variables (e.g.

floor and size) are in a square term with the dependent variable.

6.3.4 Independent Variables

To construct an equation, variables must be chosen carefully. Otherwise, the result of the model may not be satisfactory. Literature review on variables affecting retail property value has been done.

According to Craig, Ghosh and McLafferty (1984), there are five characteristics affecting a retail property's performance (Y). They are location (L), store attributes (S), market attributes (M), price (P) and Competition (C). A function can be expressed as: Y = f (L,S,M,P,C).

Chau, Pretorious and Yu (2000) studied the determinants of street level retail prices in Hong Kong. They also made use of Craig's proposition as base and with adjustments. In their model, variables are divided into two groups: physical variables (age, size, frontage length) and locational variables (unit in a shopping mall, shopping mall within 50m, distance from nearest MTR station, nearest to Mong Kok MTR station; and nearest to Yau Ma Tei MTR station).

Hui, Yiu and Yau (2006) explored the relationship between Hong Kong retail properties' rent and market position by the use of regression analysis. In their model, rental income was in a function of physical characteristics (e.g. age, total floor area, occupancy rate); market position; and location.

Harvesting wisdom from previous researches, the equation contains three groups of independent variables: physical, locational and agglomeration factor.

1. Physical variables: age of the building, size of the unit and floor level of the unit.
2. Locational variables: distance to Mong Kok MTR station
3. Agglomeration variable: whether there is agglomeration in the building

1) Age

Different scholars have different opinions on the age effect on retail property value. It is generally believed that they are in a negative relationship. As property becomes older, both building's structure and appearance deteriorates over time. The poor the condition, the lower the value will be resulted. Many scholars (Eppli and Tu, 2005; Sirmans and Guidry, 1993) supported that shopping malls' rent and age is negatively related, unless derelict structure and out-dated facilities are renovated regularly.

On the other hand, Tay, Lau and Leung (1999) studied the determinants of rent in Hong Kong Shopping centre. They revealed that age and rental value was positively related, due to regular facility improvement and also customers' fidelity that grows over time. Chau, Pretorious and Yu (2000) also found that age and rental value was negatively related in Hong Kong street level retail properties.

To sum up, the relationship between age and rental value is negatively related, because of deterioration on structure and facilities. However, regular renovation can enhance the value. Therefore, the relationship between age and rental value can be positive.

2) Size

Size and property value was shown to be non-linear by Lusht (1997). Value is increasing at a decreasing rate when size increases. Size or area of a retail property is always in scholars' research checklist (Chau, Pretorious and Yu, 2000; Tay, Lau and Leung, 2005).

From retailers' point of view, size of retail store is important. Different types of retail business have different space requirement. O'Roarty, McGreal and Adair (1997)

conducted a survey to examine retailers' store selection criteria. The retailers selected store area as the fourth important criteria.

3) Floor Level

Only stores locates upstairs will be examined in this model. The stores on street level will not be included, as their value are much higher than that of upstairs stores. Rental value of street level shops can be as much as 6 times higher than the upstairs stores, because pedestrian flow is much higher on street level. Therefore, conditions in street level stores and upstairs stores are much different. Excluding the street level stores can minimize difference in stores conditions. It is unfair to compare rental value of street level stores with upstairs stores, so only upstairs stores will be included in the model.

For retail use, pedestrian flow is crucial in affecting rental value. The higher the floor level, the less the pedestrian flow will be. It is believed that value decreases as floor level increases which is contrast to residential properties.

4) MTRMK

This variable measures the distance between the building and Mong Kok MTR station. The Mass Transit Railway (MTR) improves transport network and provides better linkage with other districts. Mass transit railway increases pedestrian flow to the district.

Chau and Ng (1998) showed that mass transit railway reduced price gradient between districts. Scholars supported that improvement in transportation system can add value to properties. Retail is significantly affected by pedestrian flow, so they prefer to cluster in the busy districts, e.g. Central, Causeway Bay, Tsim Sha Tsui and Mong Kok. The shorter the distance to MTR station, the larger the pedestrian flow will be. The demand for the site is greater. Thus, it is predicted rental value will be higher for the buildings nearer to MTR station.

5) Agglomeration Degree

As mentioned in chapter 4, there are plenty of agglomeration benefits and they become motivation for retailers to agglomerate. To test whether this agglomeration effect add premium to rental value, an independent dummy variable (AGGLO) is added to the equation. It is hypothesized that the relationship between agglomeration

effect and rateable value should be positively.

6.3.5 Dependent Variables

Monthly rateable value per meter square will be used as the dependent variable. Reasons for using rateable value has been discussed in section 5.4. In summary, using rateable value can eliminate time effect on property value and also it provides comprehensive record, even transaction data is not available in market.

6.3.6 Equation

After determining independent variables and functional form, we have to understand the meaning of constant term, error term and dummy variables, so an equation can be constructed.

1) Constant term

a_0 is a constant term which is an intercept of an equation. It is the expected value of dependent variable when all other independent variables (including error term) are zero in value. The estimated constant term have at least the following components:

1) the true value of a_0

2) the constant impact of any specification errors; e.g. the omission of variables

3) the mean of error term for the equation

Constant term cannot be omitted in an equation. Otherwise, biased result will be obtained. There are two effects when a constant term is missed. The first effect is that the constant effect of omitted variables is forced into the estimate of other coefficients. Their t-scores are inflated and the result is biased. Secondly, if it is omitted, it is assumed that the regression line must go through the origin which is unreasonable.

In this dissertation, a constant term will be added in the equation, for providing a unbiased result.

2) Error term

Error term is represented by "ε" which means a stochastic error. The equation incorporates it as stochastic representation of the model. (Eastman, 1984)

An error term is required for an equation, as it is assumed that all prediction is subjected to errors and not all variables can be measured accurately. The source of an error and actual error size is unknown, so an error term is essential. Another point need to aware is that the error term is a theoretical concept that is not observable in

real world.

3) Dummy

When some concepts which are qualitative in nature and cannot be quantified, a dummy variable is used. For dummy variable, 1 represents the existence and 0 represents the non-existence. In this dissertation, there is one dummy variable, i.e. AGGLO, it means whether there is agglomeration effect in the building.

4) Model

The main purpose is to test whether homogeneous agglomeration effect adds value to rateable value and its significance. There are seven independent variables and dependent variable (rateable value) is taking natural logarithm, where agglomeration is a dummy variable. FL^2 and $SIZE^2$ are added, since it is hypothesized that floor level and unit size are having non-linear relationship with dependent variable (rateable value).

$$\text{Log(Rateable)} = a_0 + a_1 FL + a_2 FL^2 + a_3 SIZE + a_4 SIZE^2 + a_5 AGE$$
$$+ a_6 MTRMK + a_7 AGGLO + \varepsilon$$

Where:

RATEABLE	= Monthly rateable value per m^2
FL	= Floor level
FL^2	= Floor level (squaring)
SIZE	= Size of the unit
$SIZE^2$	= Size of the unit (squaring)
AGE	= Age of the building
MTRMK	= Distance to Mong Kok MTR station
AGGLO	= Homogeneous agglomeration (dummy variable)

5) Expected Sign

Physical Variables		
Independent Variable	**Expected Sign**	**Meaning**
FL	−	The higher the floor level, the lower the value
FL^2	+	Decreasing of value in an increasing rate
SIZE	−	The larger the unit size, the lower the value
$SIZE^2$	+	Decreasing of value in an increasing rate
AGE	−	The older the building, the lower the value
Locational Variables		
MTRMK	−	The shorter the distance to the Mong Kok MTR station, the higher the value
Agglomeration Degree Variables		
AGGLO	+	With agglomeration, the higher the value

Table 6.1 Summary of expected signs

Chapter 7

Results and Discussions

7.1 Introduction

Before discussing the regression results, meaning of coefficient, t-statistics, p-value and adjusted R-squared should be understood. Then, regression results and discussions will be followed.

7.2 Coefficient

Estimated partial regression coefficients go by many names: Regression coefficients, estimated coefficients, parameter estimates, point estimates, coefficient estimates, and slope estimates (Eastman, 1984).

The regression coefficients are estimated via OLS technique. They specify an individual effect of each independent variable upon the dependent variable, holding other variable constant. When there is one unit change in independent variable, the dependent variable changes by the value of that specific independent variable's coefficient.

7.3 t-statistics

t-test is used to test hypotheses about individual regression slope coefficients. t-statistic is calculated by the coefficient over standard error, while standard error is to determine statistical significance of coefficient. Eastman (1984) states that statistical significance refers to how confident the estimated partial regression coefficient represents true regression coefficient.

When we interpreting t-statistic, the sign can be ignore and only absolute value is crucial. The larger the absolute value of t-statistic is, the greater the likelihood that the estimated regression coefficient is significant from zero.

7.4 p-value

p-value is the alternative approach to t-test. p-value represents probabilities, based on the associated t statistic and it runs between 0 to 1. It tells the lowest level of significance at which null hypothesis can be rejected, provided that the sign is in predicted direction. The small p-value doubts the null hypothesis. Usually when p-value is smaller than 0.05, the null hypothesis is rejected. In other words, our hypothesis is not rejected and significant at the 5% level.

In this dissertation, p-value is used to test the significance of the coefficient.

7.5 Adjusted R-squared ($\overline{R}^2$)

The coefficient of determination (R^2) used measure of fit is the coefficient of determination. The higher the R^2, the closer the estimated regression equation fits the sample data. This measurement is called "goodness of fit" measures. R^2 must lie between 1 and 0 (i.e. $0 \leq R^2 \leq 1$). When R^2 is closer to 1, the explanatory power of an equation is better.

However, R^2 is not perfect, as adding an additional independent variable into an equation can never reduce R^2. R^2 is useless for deciding whether to add an additional independent variable for improving the ability to explain a dependent variable. Studenmund (2006) stated that "the increase in the quality of the fit caused by the addition of a variable needs to be compared to the decrease in the degrees of freedom before a decision can be made with respect to the statistical impact of the added variable". In short, we cannot rely on R^2 in deciding whether to add an additional independent variable. It is because R^2 will not decrease when additional independent variable is added.

Therefore, adjusted R-squared ($\overline{R}^2$) is used. It is the R^2 adjusted for degree of freedom. In short, $\overline{R}^2$ measures the percentage of variation of dependent variable around its mean that is explained by a regression equation, adjusted for degrees of freedom. It will decrease or increase when an additional independent variable is added, depending on whether the improvement in fit caused by additional variable outweighs the loss of the degrees of freedom.

7.6 Regression Result

Recall that the equation is:

$$\text{Log(Rateable)} = a_0 + a_1 FL + a_2 FL^2 + a_3 SIZE + a_4 SIZE^2 + a_5 AGE$$

$$+ a_6 MTRMK + a_7 AGGLO + \varepsilon$$

Where:

RATEABLE	= Monthly rateable value per m^2
FL	= Floor level
FL^2	= Floor level (squaring)
SIZE	= Size of the unit
$SIZE^2$	= Size of the unit (squaring)
AGE	= Age of the building
MTRMK	= Distance to Mong Kok MTR station
AGGLO	= Homogeneous agglomeration (dummy variable)

Firstly, linear form was tried to be used. However, it did not give a good result as taking natural log for dependent variable. Using linear form, the adjusted R^2 is 0.88.

However, adjusted R^2 is improved to 0.94 and p-values are also improved after taking natural log on dependent variable (i.e. rateable value). Therefore, semi-log form was employed.

Moreover, it is hypothesized that the relationship between rateable value and floor level and size is non-linear. Therefore, FL^2 and $SIZE^2$ are added into the equation.

Dependent Variable: LOG(RATEABLE)
Method: Least Squares
Date: 03/20/09 Time: 13:05
Sample(adjusted): 1 219
Included observations: 219 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.71885	0.314456	34.08692	0.0000
FLOOR	-0.067025	0.012143	-5.519886	0.0000
FLOOR^2	0.002278	0.000453	5.028299	0.0000
SIZE	-0.003872	0.000754	-5.133029	0.0000
SIZE^2	7.17E-06	2.10E-06	3.416978	0.0008
AGE	-0.108469	0.007680	-14.12351	0.0000
DMKMTR	-0.007591	0.000410	-18.50131	0.0000
AGGLO	0.283274	0.063406	4.467635	0.0000

R-squared	0.939720	Mean dependent var	5.196632
Adjusted R-squared	0.937720	S.D. dependent var	0.616273
S.E. of regression	0.153797	Akaike info criterion	-0.870525
Sum squared resid	4.990872	Schwarz criterion	-0.746723
Log likelihood	103.3224	F-statistic	469.9048
Durbin-Watson stat	2.029647	Prob(F-statistic)	0.000000

Table 7.1 Summary of regression result

Table 7.1 summarized the regression result. All independent variables are significant

at the 1% level. Adjusted R-squared is 0.938, which means that 94% of the change in rateable value can be explained by the change in one or more of the independent variables. One point to note, coefficients shall be interpreted in terms of percentage, as semi-log form is employed in the equation.

7.7 Discussion

1) Floor level *(FL* and *FL^2)*

Both ***FL*** and ***FL^2*** are significant at the 1% level. ***FL*** is negatively related to rateable value. It means the higher the floor level, the lower the rateable value will be. It is logical for retail use, higher level store usually get lesser pedestrian flow. This is also the case for shops in shopping mall, where stores on lower floor level (except basement) require higher rent.

FL^2 is positively related to rateable value. Therefore, the value is decreasing in an increasing rate. Stores in lower floor level can be seen easily by customers through their windows. The retailers usually place some goods, advertisement and poster in the window, pedestrian can easily find the shops or attract by the advertisements. However, stores in high level cannot do so and they receive less customers. Therefore, the value is decreasing in an increasing rate as floor level increases.

2) Size (*SIZE* and $SIZE^2$)

SIZE and $SIZE^2$ is significant at the 1% level. As expected, ***SIZE*** is negative related to the unit rateable value. $SIZE^2$ is positive related to unit rateable value. The larger the property size, the lower the per unit value will be. It is due to economics of scale on the construction cost. The increase in per unit construction cost is proportionally lower for the stores in larger total floor area. Furthermore, Chau, Pretorious and Yu (2000) revealed the demand for small stores are higher than the larger stores, due to the high population density.

Furthermore, positive sign of $SIZE^2$ means the decrease in per unit value is in an increasing rate. This is supported by Lusht (1997), "the relationship between building size and building value tends to be non linear, with value increasing at a decreasing rate as size increases."

3) Age

Age is significant at the 1% level. It is negative related to rateable value as expected. The older the building, the worse is the condition due to deterioration. The result is opposite to the research by Chau, Pretorious and Yu (2000). In their finding, the relationship between age and street level shops' price is positive. In their opinion,

refurbishment enhances property value regardless the building age. Therefore, there was positive relationship between two variables.

However, retail properties in this dissertation are not on street level. They are in vertical level and locate in Mong Kok. Thus, the result will be a bit different from the researches on street level shops. Though regular refurbishment can improve appearance and conditions of the buildings (suggested by previous researches), it is hindered by multiple ownership. Some commercial buildings are in multiple-ownership which makes refurbishment difficult.

4) Distance to Mong Kok MTR Station (MTRMK)

It is significant at the 1% level and it is in negative sign. In other words, shops locate nearer to Mong Kok MTR station are having higher rental value. It is because of convenient transport linkage and high accessibility, pedestrian flow in Mong Kok MTR station is high. Moreover, there are many shopping centres for both families and especially for young people, e.g. Langham Place, Gala Shopping Centre, Trendy Zone, etc. Furthermore, famous shopping streets and facilities have been developed, such as Fa Yuen Street (selling sports shoes) and Tung Choi Street ('Women Street' selling low order heterogeneous goods). Besides, pedestrian prioritized zones provide safer

and comfortable environment for shoppers and attract higher pedestrian flow. Therefore, the shorter the distance to Mong Kok MTR station, the higher is the value.

5) **Agglomeration Effect (AGGLO)**

It is positively related to rateable value and it is significant at the 1% level. The coefficient is 0.28. It means that homogeneous agglomeration adds value (28%) to rateable value (rental value), holding other independent constant. Null hypothesis is rejected. The hypothesis of "*Clustering of homogeneous product sellers in a building enhances retail property value"* is not rejected. That means retailers are willing to pay higher rent for stores where there are stores selling similar or same type of product with them. They propend to locate next to or near to their competitors.

This behaviour is not non-sense, as they are enjoying agglomeration benefits mentioned in section 4.3, 4.4 and 4.5, which include the increase in market size, the advertising effect and the presence existing market. These benefits have been proved by the scholars.

Therefore, homogeneous agglomeration does not just benefit buyers for reducing search cost and also benefit to shop owners whose properties are adding value.

Chapter 8

Conclusion

Agglomeration is a mysterious phenomenon. It can be observed worldwide, especially in Hong Kong, where living environment is crowded and land use competition is keen. We can observe shops selling homogeneous products cluster on the same street or in the same building, especially in crowded districts where rent is high, such as Mong Kok, Causeway Bay and Tsim Sha Tsui.

The reasons behind homogeneous agglomeration in retail can be explained from consumers' and retailers' perspectives. From consumers' aspect, they tend to go the clusters due to limited information (both price and quality information) about products. The clusters make comparison earlier, so consumers can compare both price and quality from different retailers at the same trip. They can save search cost from traveling to different markets for making comparison.

From retailers' perspective, clustering is beneficial. As Konishi (2005) has proved that consumers' propensity to purchase is higher in a cluster than in a single shop, so retailers cluster can enjoy larger sale volume. Furthermore, a cluster is actually

enjoying an advertising effect, where reputation is grown. Consumers usually have a prospect that they can be offered a lower price in a cluster, due to keen competition between retailers. These two psychological effects act together driving consumers to the cluster. Another reason is that a cluster giving a message to the new firms that there is an existing market (Beckmann, 1999). They save search cost for shop locations. They move to the existing cluster, instead. New comers are actually enjoying agglomeration benefit developed by existing retailers.

Because of the clustering benefits, it is reasonably suspected competition for getting a place in the cluster is great and rental value is bidden up. Therefore, the hypothesis is developed.

Opposing to Hotelling's idea that homogeneous agglomeration of firms is wastage to society, many scholars (Chamberlin, 1933; Eaton and Lipsey, 1979; Konishi, 2005) found that it is beneficial to have firm clustering. The main purpose of this dissertation is to find out homogeneous agglomeration effect on retail property value. It is revealed that retail agglomeration adds premium to property value. This finding helps developers and property owners to arrange tenant mix by grouping retailers selling similar products together.

8.1 Summary of the Finding

The main purpose of this dissertation is to test whether retail homogeneous agglomeration adds value to property rateable (rental) value. Recall the hypothesis is "*Clustering of homogeneous product sellers in a building enhances retail property value"*.

Hedonic price model is employed to test the hypothesis. There are seven independents variables in the equation. The regression analysis revealed that all independent variables are significant statistically. Therefore, their relationships do not occur by chance.

To test the effect of retail homogeneous agglomeration (i.e. retailers selling similar or homogeneous products) on property rateable value, an independent variable (***AGGLO***) is added to the equation. The regression result demonstrates that coefficient of ***AGGLO*** is positive and is significant at the 1% level. Null hypothesis is rejected. In other words, the hypothesis is not rejected. It supports that homogeneous agglomeration adds premium to retail property value.

To test the relationship between floor level and unit rateable value, ***FL*** and $\boldsymbol{FL^2}$ are

added. They are both significant at the 1% level. Coefficient of ***FL*** is negative which means that higher floor level result in lower unit rateable value. While coefficient of $\boldsymbol{FL^2}$ is positive, it shows that unit rateable value decreases in an increasing rate. It is due to the loss of pedestrian flow in upper floor level.

The relationship between size (***SIZE*** and $\boldsymbol{SIZE^2}$) and unit rateable value was tested. Coefficient of ***SIZE*** is negative and $\boldsymbol{SIZE^2}$ is positive. It reveals that when size of the stores increases, the unit rateable value decreases in an increasing rate. It once again supports the result from past researches. The main reason is due to lower demand for large stores in Hong Kong and also due to economies of scale.

For property age, it is revealed that the older the building, the lower is the rateable value. The result is different from past research on Mong Kok street level shops (Chau, Pretorious and Yu, 2000). The main reason is due to the difference in the category of shops. In previous research, they tested on street level shops. While for this dissertation, upstairs stores of four buildings are tested. Street level shops exist in an individual unit, which can be refurbished easier. Therefore, regular refurbishment improves store conditions. Age does not significantly affect price of the street level shops. On the contrary, upstairs stores which maybe in multiple-ownership that makes

refurbishment difficult. Therefore, the older the building, the lower is the rateable value for upstairs stores.

For locational factor, the distance between buildings and Mong Kok MTR station was tested. The result demonstrates the longer the distance to Mong Kok MTR station, the lower is the rateable value. It is because pedestrian flow is higher for area near MTR station. Retailers are paying higher rent for stores near to Mong Kok MTR station.

8.2 Limitation of the Study

Small sample size is the first limitation. For this regression analysis, four buildings with total 219 samples were tested. Because retail property transaction is not active and rental price is seldom disclosed, transaction data is rare. Rateable value is used in this dissertation, as it provides comprehensive data for retail analysis. However, free of charge rateable value is just obtainable from Rating and Valuation Department website in April. Due to limited resources, relatively small number of samples is tested.

Furthermore, only samples in Mong Kok are tested. Because locational effect significantly affects property value, the analysis focuses on one single district only.

Inter-district comparison is not available in this dissertation.

The study can be deepened by investigating the relationship between ownership and degree of agglomeration in a building. As it is suspected multiple-ownership deters owners to manage the tenant mix and group retailers selling similar goods together. When there are multiple owners, an organized tenant mix plan is impossible, since owners may have already leased out the stores. Moreover, it needs coordination between owners for getting an organized and mutually agreed tenant mix plan. It is costly and negotiation is time consuming. However, limited resources hinder this research for having deeper analysis on this area.

To make the research more comprehensive, agglomeration benefits mentioned in chapter 4 should be tested. Since those benefits are developed by scholars theoretically, they should be tested against empirical data to see whether they are applicable to Hong Kong situation. However, this is not done in this dissertation, due to the difficulty to gather data. For testing the viability of agglomeration benefits, huge amount of data is required, such as customers' perspective and retailers' perspective.

8.3 Area for Further Study

Due to limited resources, the research focuses on Mong Kok only. The hypothesis can be tested on other districts, such as Tsim Sha Tsui and Causeway Bay. This can further test the viability and generalization of the theory. Moreover, the relationship between ownership and degree of agglomeration is not studied. Further study on this area can fill the gap. Understanding the issue can surely help with tenant mix coordination.

Another topic can be further explored is the behavioural issues. Retailers agglomerate in the same building and compete with each other, so how do they react to and survive in this kind of keen competition? Do they compete merely in terms of price or non-price? Do they collude or make private agreements? This area is worthy to study and it gives hints to developers and retailers on retail location issue.

APPENDIX 1: Statistics of retail trade in Hong Kong

Major industry group	Year	Number of establishments	Number of persons engaged	Number of employees	Sales and other receipts ($ Million)	Value added ($ Million)	Gross surplus ($ Million)
Retail trade	1999	47 841	188 371	128 617	206,257.8	27,093.7	9,072.5
	2000	49 173	193 764	135 288	213,379.6	28,752.4	10,357.4
	2001	49 680	194 872	135 161	206,496.7	27,385.4	8,995.3
	2002	49 013	189 812	130 810	198,562.7	27,941.0	10,554.2
	2003	47 364	182 856	127 392	191,649.3	26,437.9	10,239.2
	2004	46 310	188 636	134 866	216,557.4	34,146.6	16,288.9
	2005	46 729	198 700	145 079	233,899.5	36,089.8	16,792.1
	2006	47 228	204 298	150 386	254,219.8	39,248.4	18,115.4
	2007	46 985	212 129	162 158	279,116.0	45,184.4	21,679.1

Notes : (1) Individual items may not add up to the corresponding total owing to rounding.

(2) Value added is a measure of the contribution of an economic sector/industry to Hong Kong's Gross Domestic Product. The definition can be found in the "Report on Annual Survey of Wholesale, Retail and Import and Export Trades, Restaurants and Hotels".

Source : Distribution Services Statistics Section,
Census and Statistics Department
(Enquiry telephone no. : 2802 1264)

APPENDIX 2: Statistics of retail sale in Hong Kong

Year	Month	Value			Volume	
		HK$Mn	Index (Monthly average of 10/2004 - 9/2005 = 100)	Year-on-year % change	Index (Monthly average of 10/2004 - 9/2005 = 100)	Year-on-year % change
2005		204,372	101.3	N.A.	101.3	N.A.
2006		219,002	108.5	+7.2	107.0	+5.7
2007		247,000	122.4	+12.8	117.9	+10.1
2008		273,126	135.4	+10.6	123.8	+5.0

Notes : The value index measures the changes in value terms, while the volume index, obtained by deflating the value index by a specially constructed price index, measures the changes in real terms.

The above retail sales statistics are compiled based on the Hong Kong Standard Industrial Classification Version 2.0.

'0.0' Denotes increase or decrease of less than 0.05%.

Source : Distribution Services Statistics Section,
Census and Statistics Department
(Enquiry telephone no. : 2802 1258)

Appendix 3: Data base for regression analysis

878.3588941	1	301.699	36	40	1
394.7021045	2	382.567	36	40	1
394.7021045	3	382.567	36	40	1
696.4077352	4	216.827	36	40	1
394.0954225	5	233.446	36	40	1
520.4652059	6	77.815	36	40	1
305.2110776	6	155.63	36	40	1
394.0954225	7	233.446	36	40	1
394.0954225	8	233.446	36	40	1
552.5855865	9	38.908	36	40	1
552.5855865	9	38.908	36	40	1
340.5513076	9	77.815	36	40	1
308.4238257	9	77.815	36	40	1
526.8839313	10	38.908	36	40	1
227.0312875	10	116.724	36	40	1
559.0181842	10	77.815	36	40	1
469.0552072	11	38.908	36	40	1
469.0552072	11	38.908	36	40	1
469.0552072	11	38.908	36	40	1
469.0552072	11	38.908	36	40	1
469.0552072	11	38.908	36	40	1
469.0552072	11	38.908	36	40	1
525.974026	12	77	36	40	1
404.8010692	12	38.908	36	40	1
404.8010692	12	38.908	36	40	1
525.974026	12	77	36	40	1
552.5855865	13	38.908	36	40	1
552.5855865	13	38.908	36	40	1
311.6883117	13	77	36	40	1
344.1558442	13	77	36	40	1
394.08	14	233.446	36	40	1
394.08	15	233.446	36	40	1
480.5194805	16	77	36	40	1
337.6623377	16	154	36	40	1

394.0954225	17	233.446	36	40	1
370.1298701	18	154	36	40	1
383.1168831	18	77	36	40	1
394.0954225	19	233.446	36	40	1
394.0954225	20	233.446	36	40	1
141.0754447	10	97.82	38	160	0
126.2684836	10	68.98	38	160	0
126.2684836	10	68.98	38	160	0
126.2684836	10	68.98	38	160	0
126.2684836	10	68.98	38	160	0
124.8795264	10	72.63	38	160	0
100.9407197	10	66.97	38	160	0
100.9407197	10	66.97	38	160	0
100.9407197	10	66.97	38	160	0
100.9407197	10	66.97	38	160	0
87.20098139	11	97.82	38	160	0
113.3661931	11	68.98	38	160	0
113.3661931	11	68.98	38	160	0
113.3661931	11	68.98	38	160	0
113.3661931	11	68.98	38	160	0
108.2197439	11	72.63	38	160	0
101.2393609	11	66.97	38	160	0
101.2393609	11	66.97	38	160	0
101.2393609	11	66.97	38	160	0
101.2393609	11	66.97	38	160	0
87.50766714	12	97.82	38	160	0
113.6561322	12	68.98	38	160	0
113.6561322	12	68.98	38	160	0
113.6561322	12	68.98	38	160	0
113.6561322	12	68.98	38	160	0
108.4951122	12	72.63	38	160	0
101.5380021	12	66.97	38	160	0
101.5380021	12	66.97	38	160	0
101.5380021	12	66.97	38	160	0
101.5380021	12	66.97	38	160	0
87.71212431	13	97.82	38	160	0
113.8011018	13	68.98	38	160	0
113.8011018	13	68.98	38	160	0

113.8011018	13	68.98	38	160	0
113.8011018	13	68.98	38	160	0
108.7704805	13	72.63	38	160	0
101.6873227	13	66.97	38	160	0
101.6873227	13	66.97	38	160	0
101.6873227	13	66.97	38	160	0
101.6873227	13	66.97	38	160	0
87.91658148	14	97.82	38	160	0
114.0910409	14	68.98	38	160	0
114.0910409	14	68.98	38	160	0
114.0910409	14	68.98	38	160	0
114.0910409	14	68.98	38	160	0
109.0458488	14	72.63	38	160	0
101.9859639	14	66.97	38	160	0
101.9859639	14	66.97	38	160	0
101.9859639	14	66.97	38	160	0
101.9859639	14	66.97	38	160	0
88.12103864	15	97.82	38	160	0
114.38098	15	68.98	38	160	0
114.38098	15	68.98	38	160	0
114.38098	15	68.98	38	160	0
114.38098	15	68.98	38	160	0
109.3212171	15	72.63	38	160	0
102.284605	15	66.97	38	160	0
102.284605	15	66.97	38	160	0
102.284605	15	66.97	38	160	0
102.284605	15	66.97	38	160	0
88.32549581	16	97.82	38	160	0
114.6709191	16	68.98	38	160	0
114.6709191	16	68.98	38	160	0
114.6709191	16	68.98	38	160	0
114.6709191	16	68.98	38	160	0
109.5965854	16	72.63	38	160	0
102.4339256	16	66.97	38	160	0
102.4339256	16	66.97	38	160	0
102.4339256	16	66.97	38	160	0
102.4339256	16	66.97	38	160	0
88.52995297	17	97.82	38	160	0

114.9608582	17	68.98	38	160	0
114.9608582	17	68.98	38	160	0
114.9608582	17	68.98	38	160	0
114.9608582	17	68.98	38	160	0
109.8719537	17	72.63	38	160	0
102.7325668	17	66.97	38	160	0
102.7325668	17	66.97	38	160	0
102.7325668	17	66.97	38	160	0
102.7325668	17	66.97	38	160	0
88.83663872	18	97.82	38	160	0
115.2507973	18	68.98	38	160	0
115.2507973	18	68.98	38	160	0
115.2507973	18	68.98	38	160	0
115.2507973	18	68.98	38	160	0
110.147322	18	72.63	38	160	0
102.8818874	18	66.97	38	160	0
102.8818874	18	66.97	38	160	0
102.8818874	18	66.97	38	160	0
102.8818874	18	66.97	38	160	0
89.04109589	19	97.82	38	160	0
115.5407364	19	68.98	38	160	0
115.5407364	19	68.98	38	160	0
115.5407364	19	68.98	38	160	0
115.5407364	19	68.98	38	160	0
110.4226903	19	72.63	38	160	0
103.1805286	19	66.97	38	160	0
103.1805286	19	66.97	38	160	0
103.1805286	19	66.97	38	160	0
103.1805286	19	66.97	38	160	0
89.24555306	20	97.82	38	160	0
115.8306756	20	68.98	38	160	0
115.8306756	20	68.98	38	160	0
115.8306756	20	68.98	38	160	0
115.8306756	20	68.98	38	160	0
110.6980587	20	72.63	38	160	0
103.4791698	20	66.97	38	160	0
103.4791698	20	66.97	38	160	0
103.4791698	20	66.97	38	160	0

103.4791698	20	66.97	38	160	0
89.45001022	21	97.82	38	160	0
126.2684836	21	68.98	38	160	0
126.2684836	21	68.98	38	160	0
126.2684836	21	68.98	38	160	0
126.2684836	21	68.98	38	160	0
119.9228969	21	72.63	38	160	0
103.7280374	21	66.97	38	160	0
103.7280374	21	66.97	38	160	0
103.7280374	21	66.97	38	160	0
470.6413901	1	106.238	17	360	1
385.9329995	2	106.238	17	360	1
367.1002843	3	106.238	17	360	1
367.1002843	4	106.238	17	360	1
361.8084634	5	51.823	17	360	1
328.0396735	6	51.823	17	360	1
359.0733591	7	25.9	17	360	1
359.0733591	7	25.9	17	360	1
328.0396735	8	51.823	17	360	1
328.0396735	9	51.823	17	360	1
328.0396735	10	51.823	17	360	1
328.0396735	11	51.823	17	360	1
359.0733591	12	25.9	17	360	1
359.0733591	12	25.9	17	360	1
359.0733591	13	25.9	17	360	1
359.0733591	13	25.9	17	360	1
359.0733591	14	25.9	17	360	1
359.0733591	14	25.9	17	360	1
328.0396735	15	51.823	17	360	1
328.0396735	16	51.823	17	360	1
359.0733591	17	25.9	17	360	1
359.0733591	17	25.9	17	360	1
328.0396735	18	51.823	17	360	1
328.0396735	19	51.823	17	360	1
328.0396735	20	51.823	17	360	1
328.0396735	21	51.823	17	360	1

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