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THE UNIVERSITY OF HONG KONG

EMPIRICAL STUDY ON
THE IMPACT OF OFFICE DECENTRALISATION
ON NEIGHBOURHOOD RESIDENTIAL PROPERTY
IN HONG KONG

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

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY
YEUNG KIN LUN
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: ________________________________
Abstract

Office decentralisation has been a common phenomenon for about twenty years in Hong Kong. There are many commercial buildings developed quite far away from the central business district (CBD). As time goes by, Hong Kong is being transformed from a monocentric pattern into a polycentric pattern. During the process of office decentralisation, the impacts on the nearby residential properties may be positive or negative, as reflected on the housing prices.

There are substantial researches on the property price gradient along the distance to CBD or office nodes. However, there is little concern on the on-going change of housing prices of nearby residential properties due to the developments of new decentralised offices. Moreover, researchers always assume the same magnitude of effect on all floors in the same building.

This dissertation aims at studying the impact of office decentralisation on nearby residential properties. The single effect of an additional commercial building in a decentralised office region is investigated using a hedonic price model. The expectation effect is estimated in the post-announcement stage, while the actual effect is estimated in post-completion stage. Besides, instead
of studying the proximity effect in a horizontal dimension, the specific impacts on different floors in a vertical dimension are explored.

The empirical results show that decentralised office has positive impact on the neighbourhood residential properties in both the post-announcement stage and the post-completion stage. But purchasers have an over-expectation on the impact of this issue. In addition, decentralised office has less positive impact on the lower floors in the post-announcement stage, and surprisingly has negative impact on the lower floors in the post-completion stage.
Acknowledgement

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Special thanks should be given to Prof. K.W. Chau for teaching me additional techniques in regression. His enormous help in data collection and data analysis enables me to overcome the difficulty in conducting this research.

Last but not least, I have to thank my family members and girlfriend for their continuous supports and tolerances to me.
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1.1 Background

The Central Business District (CBD) provides maximum accessibility to a diverse of labour market and market information. In most international cities, in order to benefit from accessibility and from a prestigious address, firms have demanded more and more office space within the central area. But eventually when the CBD becomes saturated, decentralisation offers the only possibility to expand office spaces. The process has been adopted in many cities, and Hong Kong has no exception.

In Hong Kong, office decentralisation first started with the inception of Metroplan Study and Territorial Development Strategy (TDS) by the Hong Kong Government in the 1980s. After a series of strategy reviews, based on this two government studies, the office development strategy broadly consisted of three ways. They were:

- further expansion of CBD through Central-Wanchai Reclamation and West Kowloon Reclamation;
development of new office nodes near the MTR stations in Quarry Bay and Kwun Tong; and

development of non-metro office nodes in conveniently accessible locations in the New Territories.

There is a strong professional consensus among planners and surveyors that the above policies would have impact on the dominant position of CBD in office employment. It is believed that improved accessibility due to the railway, improvement in communication technology and increasing rental in CBD would lead to decentralisation of offices and jobs away from CBD. (Lai, 1995)

Nowadays, office decentralisation is an obvious trend. However, there is little concern on the impact of office decentralisation on residential property market. Previous researches focused on office decentralisation in terms of communications, accessibility, office rental, spatial pattern of offices, etc. The cross-disciplinary of office decentralisation and residential property market is neglected but has its research value. In this dissertation, the impact of office decentralisation on residential property will be investigated using a hedonic price model.
1.2 Objectives

In this research, office decentralisation in Hong Kong is the key issue to be examined. The main objective is to investigate whether office decentralisation in Hong Kong will cause any impact on the neighbourhood property market. In a more specific way, the objectives to be achieved in this dissertation are:

1. To review the knowledge of office location and office decentralisation

2. To find out the impact of office decentralisation on neighbourhood residential properties in the terms of time and floors
1.3 Organisation

This dissertation contains eight chapters. Chapter 1 is an introduction giving the background, objectives and organisation of the dissertation.

Chapter 2 is a comprehensive literature review. It consists of different approaches of office location research, office decentralisation theories in global context and Hong Kong context, and the impact of office on residential property. Apart from academic researches, Chapter 3 briefly describe the current status of office decentralisation in Hong Kong, including the office market, office decentralisation trend, government involvement in this issue, and suggestions of its impact on residential properties.

Chapter 4 explains the hypothesis, which is the main focus of this research. Chapter 5 provides the research methodology. It explains the hedonic price model, which is used to test the hypothesis, as well as the area of study and model formulation.
Chapter 6 explains the data collection process, the sources of data and the basis of data selection. The results from the hedonic price model and interpretations are clearly explained in Chapter 7.

Chapter 8 is the conclusion. The summary of findings, implications and limitation of research, and suggestions on further studies are stated.
“Office location research relies heavily upon an empirical rather than a theoretical base. Attention has largely been devoted to what actually happens (description) rather than to what ought to happen (normative)”. In the field of office location research, this is a famous statement by Goddard (1975).

The above statement is quoted by many scholars, for example, Daniels (1979), Lai (1995), Han (1999), etc. It implies that there are two divergent approaches to office location studies, called behavioural approach and normative equilibrium approach. And more importantly, it shows that it is necessary to develop a more reliable theoretical basis in this field of research.

The behavioural approach (or survey approach) relies on survey results and focuses on describing the behaviour of choosing locations. The normative equilibrium approach considers many factors and adopts economic models for locations in order to achieve market equilibrium.

In office location researches, the sub-title “office decentralisation” is always seen. It is no doubt that decentralisation is an inevitable evolution process for every growing city. Therefore, office decentralisation theories
naturally become a sub-group of office location research, and they attract more and more attention recently.

Experiences from all over the world show that when the land rent, density and congestion of activities in CBD increase, activities with relatively less needs to stay will be compelled away from CBD and decentralize.

Goddard (1975) brought up a proposition that “generally, the higher the degree of specialization in office activities the greater the degree of concentration in the CBD. The preference for the suburbs appears to be increasing over time, especially in the largest cities”.
2.1 Definition of Terms

Office and Office activities

Office and office activities were defined by many scholars. One of the earliest definition is by Gottmann (1970). He calls office activities as “Quaternary activities”, which involve activities in collection, processing and exchange of information as well as decision making. Goddard (1975) explains the classification of economic activity. Primary sector is agriculture, fishing, etc.; secondary sector is manufacturing; tertiary sector is service; and “Quaternary sector” includes professions and finance, which provide non-physical services to the public at large but specifically to the business community.

Among all the definitions, the most widely accepted one is by Goddard (1975). He defines office in both physical terms and functional terms. Based on these two concepts, Daniels (1975) states that “office should be regarded as an activity or group of activities with a functional rather than physical expression”. Therefore, in functional term, office activities are “activities dealing with information, idea, or knowledge, for example, information search, storage, and retrieval, and the exchange and generation of ideas”. Daniels
(1975) adds that office functions can be basically categorized into five activities – receiving information, recording information, arranging information, giving information and safeguarding assets.

Clapp (1993) further elaborates the concepts of office functions. He clearly differentiated office employment, office space and office activities from materials processing, storage of goods, retailing functions, and other non-office activities. In short, office processes information, not other physical materials.

**Central business district (CBD)**

Central business district is defined as “the area at the centre of most cities and large towns which is dominated, in terms of land use, by commercial activities. It is generally the area of highest land values and rents in the city since commercial and financial activities are willing to pay high rents in order to obtain the advantages of a central, and thus highly accessible, locations.” (Pearce, 1992) This is the most well-known definition of CBD applied by scholars.
Decentralisation

In different fields of studies, there are different interpretations on decentralisation. In this research, it means “a process or procedure that results in the withdrawal or redistribution of something from a place or centre in which it has previously been concentrated” (Woodbury & Bauer, 1953).

Office Decentralisation

According to the above definition of decentralisation, Daniels (1975) states that office decentralisation should involve the physical redistribution of office buildings, office space or office employees from the city centre to other locations not characterized by similar level of concentration.

There are two types of office movements, called complete movement and partial movement. Complete movement involves removing the entire organization from one location to another and is more frequent amongst small offices unable to maintain the costs of operating two premises. The complete movement can reduce any internal communication problems within an organization but increase the difficulties of communicating with clients and competitors. Partial movement involves separation of office in order to minimize interference with existing communications links with clients and
others and at the same time to increase the efficiency of routine function. Usually, the departments involved in routine function will leave and operate equally well at non-central location. (Daniels, 1975)

**Agglomeration economies**

Agglomeration is the phenomenon of spatial clustering, or a concentration of firms in a relatively small area. The clustering and linkages allow individual firms to enjoy both internal and external economies. Agglomeration economies are used to describe the benefits that firms obtain when locating near each other. The basic concept is that production is facilitated when there is a clustering of economic activity. It means the potential advantage enjoyed by economic behaving units through spatial concentration of activities. Agglomeration economies are central to urban economics because they provide an economic rationale for the existence of cities. (Bogart, 1998; Glaeser, 2008)

In conventional approach, agglomeration economies are estimated by the changes in productivity per unit change in city size. In this research, the unit change in city size is assumed to be the increase in the number of office firms.
Bid-rent function

“Bid-rent function” is also called a “bid-rent curve”. According to Pearce (1992), it is the relationship which indicates the bid-rent (the amount a household or firm is willing to pay for the land use) at different distances from the city centre while maintaining a constant level of utility or profit. “If the bid-rent functions of various individuals and activities are known, the bid-rent for each activity at each distance can be compared with market rents to determine which activity will occupy each location.” (Pearce, 1992)

Contacts

According to Goddard (1975), contacts among offices can be classified into three types:

- “functional interdependencies” (contacts between office sectors);
- “spatial structures” (contacts between office employees in a particular sector within the same or adjacent spatial units); and
- “physical movements of individuals, documents and goods between areal units”.

It can be also classified in terms of characteristics of meetings. They are:

- "programme contact" (short, one-way, frequent and depends on the telephone);
- "planning contact" (two-way, longer and usually between two people); and
- "orientation contact" (sophisticated and groups of people for a conference to exchange ideas, solve problem and implement policies).

Linkages in office activities are contacts generated by the participants, including face-to-face meetings, telephone contacts, telex and other more sophisticated forms of telecommunications (Fernie, 1977).
2.2 Approaches to Office Location Research

Equilibrium Approach

The first equilibrium model for the analysis of location is made by Von Thünen (1826). His model shows the logical allocation of agricultural land among farmers. The competition among farmers will induce a downward slope land rent gradient, which is a function of transportation costs and demand. The land rent is maximum at the town centre and decrease along the distance from the centre, reaching zero at the outermost limit of cultivation. The rent diminishes outward from the centre to offset the transportation costs. Different types of agriculture have different rent gradients. For every point on the distance from centre, the use of highest gradient prevails, resulting in a concentric pattern of agricultural production. This pioneer theory achieves an equilibrium allocation of land uses and resources with a balance of demand and supply.

Based on the inspiration of the above model, Alonso (1964) changed the farmers into commuters and changed the isolated town centre into city centre. The rent gradient is a function of accessibility. His monocentric city model also forms concentric rings of land uses, and it provides a pioneer basis for the
studies of urban structure of a city. His research focused on the “bid-rent function”, and the model can be graphically presented in Figure 2.1.

Figure 2.1: Rent gradients and the concentric pattern of urban land use

(Source: Balchin, Bull, & Kieve, 1995, p. 53)

Another locational equilibrium model proposed by Muth (1969) shows the interaction between residential location and location of firms. It is the first equilibrium model that the location of firms is considered. Based on the works of Alonso and Muth, Solow (1973) develops a simple model of an abstract city. After considering rent, distance from CBD, wages, utility, profit and population as the major variables; his equilibrium analysis suggests that the rent gradients
of firms, household and agriculture are in descending order.

White (1976) extends the theory of firm location, and states that firm suburbanization creates employment sub-centres, which affect the city in three ways. Firstly, households will be better off. Secondly, the area of urban land in the city increases. Thirdly, the total urban land value will be changed.

However, Clapp (1983a) criticizes the above models that “transportation is simplified by introducing a single exogenous transportation sink, the CBD”, and they neglected the spatial interest associated with the locational triangle in the industrial location theory (Weber, 1909). Despite the difference in nature between commercial and industrial sectors, the theory gives an important reference for the study of office location. Clapp develops a model which combines the features of both Weber’s theory and Von Thünen’s theory. That is, to allow travel in every direction and multiple activities competing for space respectively. His model shows the general conditions for equilibrium bid-rent functions. The general conditions are different from that in Alonso’s model as Alonso assumes that all contacts are conducted with central location while Clapp considers the contacts among interdependent activities in the agglomeration economies. Clapp’s model is more general and allows more flexible interactions across spaces.
Following Clapp’s idea, Tauchen & Witte (1983) focuses their studies on the agglomeration economy and contact patterns. They find that agglomeration economies have a strong effect on location and “agglomeration economies arise as a result of face-to-face firm interaction within the CBD”. Another point is that, after studying the office location of medium-sized U.S. cities, they believe the long-run equilibrium of office location may differ from those in the industrial location theory.

Sullivan (1986) extends the standard urban equilibrium model in two ways. First, the city centre is occupied by the officer sector, and the office sector is subject to agglomerative economies arising from the need for face-to-face contact. Second, residents choose between two employment areas: employment opportunities exist in both centralized office sector and decentralized manufacturing sector. It is used to explore the general equilibrium effects of zoning policies as well as the effects of suburban density controls.

The above equilibrium models provide a general framework of office location research. However, some of them have a common weakness of monocentric assumption. In the real world, monocentric city is implausible. Every metropolitan has the tendency of decentralisation. Decentralisation of a
city is the major force to change its monocentric pattern to a polycentric pattern. CBD is no longer the only major employment area in the city. Therefore, equilibrium models using monocentric assumption are not adequate to reflect the reality of land use pattern. It is necessary to do further research on normative equilibrium models for polycentric city.

**Behavioural Approach**

In the behavioural approach, many researches concentrate on some individual aspects. Some of them put much effort on the communication and interactions pattern in office location.

Fernie (1977) analyzes the contact patterns generated between firms in three cities and evaluated the role of linkages upon locations. Among all types of contacts defined in the previous section, he states that “programme contacts” (short, one-way, frequent contacts) are locational flexible and more susceptible to decentralisation. To assess the role of communication in location choice, he considers face-to-face contacts as the most important indicator. Moreover, the main factors related to the advantages of centrality include: proximity of central office to customers, staff and social facilities, recruitment of staff, proximity to the market place, tradition and prestige,
principal reasons for change of location, need for more space, lease expiry, poor condition of premises, demolition, car parking spaces, and planning consideration.

Pye (1977) attempts to build models of office location based on actual communication variables. The accommodation and salary savings as a result of office relocation from London are compared with the increase in travel costs in maintaining contacts with people in the capital. It shows that the greatest saving is obtained by a move to a town in the outer South East. Despite government provides incentives, few offices get greater savings by moving to the assisted areas because of inadequate incentives to maintain the cost of contacts. Moreover, Pye (1979) shows that, despite the apparent feasibility of replacing about 40% of meetings by teleconferences, such replacement alone would not significantly change the trade-off between communication costs and other savings. It shows the importance of face-to-face meetings, which is a major determinant of office location.

In a broader sense, Alexander (1979) combines the results of questionnaire surveys conducted by other scholars, and made a summary of factors drawing offices to city centre. The factors vary slightly in different cities. He believes that office activities cluster together in city centres mainly because
of need for direct personal contact in business transactions and information exchange.

Table 2.1: Factors drawing offices to a central location, as elicited by questionnaire surveys in 1964-1975

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<th>SYDNEY (1972)</th>
<th>DUBLIN (1973)</th>
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<td>Contact with external organisations</td>
<td>Availability of premises</td>
<td>Suitable environment</td>
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<td>Tradition</td>
<td>Customer/client accessibility</td>
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<td>Communications with rest of U.K.</td>
<td>Proximity to public transport</td>
<td>Proximity to customers</td>
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<td>Prestige</td>
<td>Rent</td>
<td>Adequate floor area</td>
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<td>Internal communications</td>
<td>Prestige</td>
<td>Low rental</td>
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<tr>
<td>Contact with government and institutions</td>
<td>Option to renew lease</td>
<td>Adequate car parking</td>
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<tr>
<td>Contact with parents and associates</td>
<td>Possibility for expansion</td>
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<tr>
<td>Central location</td>
<td>Staff availability</td>
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<td>Supply of staff</td>
<td>Ease of executive parking</td>
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<td>Central to operating area</td>
<td>Access to associated businesses</td>
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<td>Access to contacts</td>
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<td>Prestige, visibility</td>
<td>Availability of parking</td>
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<td>Staff availability</td>
<td>Convenience</td>
</tr>
<tr>
<td>Availability of services</td>
<td>Prestige, visibility, tradition</td>
</tr>
<tr>
<td>Proximity to special institutions</td>
<td>Contact with government</td>
</tr>
<tr>
<td>and government</td>
<td>Access to special services</td>
</tr>
<tr>
<td></td>
<td>Economic factors</td>
</tr>
</tbody>
</table>

(Source: Alexander, 1979, p. 19)

The importance of direct personal contact for office locations is emphasised.

However, his definition of office jobs is too specific to follow.

On the other hand, some scholars attempt to develop a general
behavioural model for analysis of office location choices. Edwards (1983) proposes a model to explain the process of location choice of service-sector institutions. It has two phases with seven steps.

Figure 2.2: The Process Model

(Source: Edwards, 1983, p. 1333)

The first phase is "decision to relocate". It starts with the first step "stimulus", which is the mismatch of environment and the institution. Then, the second step is "perception and evaluation", which are to understand the specific problem, followed by "responses" to the problem. Afterwards, it proceeds to the second phase of "choice of new premises". The institution will collect market information and find an alternative premise. That is the
“evaluation” and “choice” respectively. Finally, the last step is “implementation” of the choice, which means to relocate to a new place. The process model is actually looping itself. It means the final step will be followed by the first step again. The model helps understanding the process of decision making but it still lacks precision.

Combination of Both Approaches

Clapp (1993) attempts to combine the literature in the normative equilibrium and behavioural approach, and made further elaborations of office location decision. He concludes that the fundamental factors driving office locations are:

- agglomeration economies (access to specialized facilities and specialized labour);
- factor costs (such as rent, cost of labour);
- transportation costs (including commuting cost, cost of maintaining contact with clients and other office users);
- political factors (including government stability and exchange rates); and
- amenities (such as climate and living costs).

These five factors are then used as a framework for evaluating regional,
international, and inter-metropolitan location decisions.

Clapp (1993) tests the hypothesis that both cross-sectional and dynamic variables are important determinants of dynamic patterns and office market forecasts. Location quotient and growth quotient are invented to incorporate the behavioural approach into the neoclassical model for hypothesis testing.

This is one of the scarce researches in the direction of combining both normative equilibrium and behavioural approach. The generalization of both approaches is necessary for further development in the future.

**Commentary and Contributions**

Both normative equilibrium and behavioural approach have its pros and cons. The behavioural approach emphasizes on agglomeration economies and office communication, with a large amount of data and empirical results to support the specific models. However, this approach actually lacks theoretical support. The factors affecting location choices cannot be clearly justified by a general theory.

On the other hand, normative equilibrium approach provides a more sophisticated and comprehensive location model by considering all the economic factors. However, it lacks detailed and specific results. The
approach is criticized for its over simplification of the reality.

Both approaches can provide persuasive theories or models in different aspects. Either approach can fill in the academic loophole of another approach. However, there are very few researches which can integrate both approaches. Generally, behavioural approach is relatively more popular and more common to be adopted by scholars, especially in the area of office decentralisation research.

In behavioural approach, there are extensive and sufficient researches focusing on office communications as an important variable in most surveys of office location choice. In fact, as stated in Daniels (1979), there are other factors such as staff availability, supply of office floor space, markets, tradition and prestige which influence location choice but which collectively have received much less attention from scholars. The reason may be due to the weak and intangible quality of some data sources and location variables which present too many difficulties for objective analysis.

The main contribution of the above researches on office location models is to provide a conceptual framework and fundamental support for the development of office decentralisation theories, which will be illustrated in the coming section.
2.3 Office Decentralisation Theories

When the CBD becomes saturated, further vertical development is too costly, horizontal expansion is impossible because of the lack of sites. Decentralisation thus offers the only possibility for an expansion in office space and the process has been adopted in most capitalist countries. (Balchin, et al., 1995) The following shows a comprehensive literature review on different types of office decentralisation studies.

Global context

Clapp (1984) explains why sub-centres evolve. He develops a model which departs from the New Urban Economics (NUE) model. NUE model assumes simple pattern of transport demand that residents need to contact business firms located at the exogenous CBD, which means that the CBD comes from outside the model and is unexplained by the model. Clapp replaces the CBD by an economic agent (G-agent). This permits the CBD to be endogenous, which means the CBD arises from within the model and can be explained by the model. In this way, the effect of existence of a sub-centre and the location criteria of individual firms can be studied. By adding relocation
cost into the bid-rent function, equilibrium is no longer unique. An agent continues to occupy that location, until the net savings of relocation is greater than the relocation costs. The evolution of sub-centre is mainly caused by increase in demand, which raises the production level for interdependent agents. Increase in production needs new spaces in suburban. It allows bid-rents to increase and then outbid the agriculture. The development of this model is an important step towards office decentralisation.

Centralisation enhances efficient communication between offices and maintains contacts with clients and business counterparts. However, the disadvantages turn out to be traffic congestion, overcrowding in railway services, inadequate and expensive parking spaces, and extremely high land rents. Therefore, people will evaluate the cost and benefit of decentralisation before making the decision to relocate or not.

Clapp (1983b) attempts to build another model to measure the effect of office decentralisation based on contacts among office activities. The total transportation costs involved before and after decentralisation can be assessed. He defines “communication damage” as the extra travel costs, including time, needed to maintain the same level of contacts. The “communication damage” due to office decentralisation can be estimated as
Rhodes & Kan (1971) study the actual office relocation by conducting a detailed opinion survey of decentralised firms. Results show that the main decision making criteria for decentralisation of offices are:

- the effect on the operating costs of the office activities moved, and the transitional costs involved;
- the effect on the way in which resources are used, e.g. the likely effect on unemployment;
- additional social effects (including the effects on key staff who would force to move with the office); and
- the effect on communication links and any resulting change in operational efficiency and productivity.

On the other hand, the three most regularly mentioned disincentives of decentralisation are loss of contact with internal offices in London, wasted time in travelling to London and cost of communication.

Apart from cost and benefit analysis, Goddard (1975) states that “a relocation involves a change in communication behaviour that will have more far-reaching consequences than merely direct communication costs”. He
broadly summarizes the effects of relocation on office communication under three headings:

- “transferability” – the possibility of transferring city centre contacts to the new locality;
- “substitutability” – the possibility of transferring city centre contacts that have not been replaced locally to telecommunication; and
- “functional change” – contact transfers and substitutability are both a consequence of the way the functions of the organization change as a result of decentralisation.

It shows that there are functional differences between decentralized offices and offices in CBD in terms of communication.

Goddard & Morris (1976) conduct a survey on the experience of decentralised offices to build models for analyzing the communication factors and patterns in office decentralisation. They find that “offices that have already decentralised or have decided to move in the near future have made rational location decision at least with respect to communication factors. In the main, it is routine or programmed functions that have been relocated”.

Another direction of study is linkages. Gad (1979) makes use of his case study in Toronto and finds that linkage intensity and the spatial concentration
of meeting partners are the two major measurable criteria used to judge the locational flexibility. Low linkage intensity and a small proportion of meeting partners in the CBD would result in relatively small increase in travel cost after decentralisation.

In addition, Gad (1985) proposes different phases of suburban office growth and arranges the order according to specific industries. The earliest phase is establishment of small offices servicing the newly emerging suburban customers. Then, it is followed by sales offices, manufacturing head offices, engineering consultants and architects, insurance, investment and accounting. The final phase involves the partial decentralisation of large clerical work force.

Another approach is the quantitative approach used by Smith & Selwood (1983), who find that there are marked sectoral differences in decentralisation. Office floor space associated with government and professional services tends to be strongly centralised, whereas financial, insurance, real estate, and business service offices shows more decentralisation. Another result they proved is that the distance from the central area is highly related to the density of office floor space, although it is declining in importance. Both findings are useful to compare results of similar studies in other cities.

Kutay (1986) conduct a survey of 50 large firms to examine the effect of
telecommunications technology on office location, and demonstrates a model of factors influencing decentralisation. The key factors in office decentralisation are shown in Figure 2.3.

Figure 2.3: Hypothesized structure model of key factors in office decentralisation

(Source: Kutay, 1986, p. 249)
Then, the correlation between decentralisation and the factors is estimated by regression, and the model structure is simplified as shown in Figure 2.4.

Figure 2.4: Estimated structure model of key factors in office decentralisation

(Source: Kutay, 1986, p. 253)

Figure 2.4 shows that office decentralisation is a function of influence level of telecommunications technology and the type of industry. Diseconomy of CBD is not a significant driving factor in decentralisation. Influence level of technology depends on size of firm and also technological sophistication. So, large firm are influenced more by telecommunication factors. In turn, Diseconomy is a function of size and technological sophistication. This approach helps explaining the different degrees of influence and their correlations for different variables.
Alexander (1979) proposes that office jobs of a lower status may not need spatial proximity to other offices as much as those of higher status. He makes a comparison of many other survey results and identifies the factors affecting firms in considering their relocation in different cities. The factors include high rent, congestion, lack of parking space, no room for expansion, proximity to executive residences, access to customers and clients, linkages and CBD access.

Table 2.2: Factors causing offices to move: a comparison of survey results

<table>
<thead>
<tr>
<th>Factor</th>
<th>London 1</th>
<th>Leeds 2</th>
<th>Cardiff 3</th>
<th>Dublin</th>
<th>New York 1</th>
<th>U.S. Cities</th>
<th>Toronto</th>
<th>Wellington</th>
<th>Sydney</th>
</tr>
</thead>
<tbody>
<tr>
<td>No room for expansion</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Reorganisation of firm</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Expiry of lease</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Demolition of premises/poor condition</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High rent/costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Staff problems</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Lack of car parking/congestion</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Poor environment</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inconvenient location</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long work journeys</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Purchase of own building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

(Source: Alexander, 1979, p. 48)
Hong Kong context

In Hong Kong, there are very few researches on office decentralisation by scholars. The most comprehensive one is done by Lai (1995).

With reference to his studies, in 1990, the Hong Kong Government completes a “Survey on Land and Facility Requirements of Commercial Offices”. The locational mobility preference of surveyed companies is investigated. It is revealed that 66% of the companies consider that, if they were going to move, it is a good idea and would seriously consider the other area near MTR and KCR stations as an option. The idea is particularly attractive to businesses like medical services, construction business, water transport, air freight forwarding and shipping or travel agencies. On the other hand, office occupiers are less receptive to the idea of developing office buildings in Tsuen Wan, Shatin, Tai Po, Tuen Mun and Yuen Long new towns. However, Lai criticises that the reliability of opinion surveys is constrained not only by sampling errors but also by the inherent problem that decision maker’s views may not correspond to the actual behaviour of the firms. Moreover, the survey only focuses on the dimension of office mobility (relocation of office establishment from CBD to off-CBD), but neglects three other dimensions of decentralisation:
- office branching (branching of CBD office establishment into off-CBD locations);
- office sprawling out (the expansion of CBD); and
- growth of new firms in off-CBD locations.

Moreover, Lai proposes a more objective alternative, that is to adopt four time-series methods (rent gradient analysis, establishment shares analysis, employment shares analysis, and relocation history analysis) to evaluate office decentralisation. His evaluation suggests that “the Central CBD has remained very dominant notwithstanding the alleged decentralising effect of the MTR”. The role of off-CBD office centres may only be subsidiary to the CBD. However, the exception is insurance and accounting which have consistent decentralisation trends. It is because new firms of these two industries are not able to afford high rents and/or not dependent on CBD location. He states that zoning more land for office use in off-CBD locations along MTR cannot change the dominant position of the CBD.

Han (1999) employs the four time-series methods suggested by Lai to test whether specific trades have experienced different degree of decentralisation in Hong Kong. All four methods yielded consistent results, and the findings are:

- high level of office decentralisation occurred in insurance and accounting;
China trades continued to occupy the non-CBD area;

solicitor and stock exchange continue to concentrate in the CBD; and

finance is not determinable as to whether it favours decentralisation or centralisation.

In another direction, Wong (2000) identified the factors of office decentralisation in Hong Kong to prove that Yuen Long New Town has potential to become a minor office node in the future. The factors are availability of office space, congestion, staffing problem, change in economy and improvement in technology, which are justified by various scholars’ surveys. However, due to different geographical environment, the five factors may not be applicable to Hong Kong or may not be sufficient to reflect the whole picture of office decentralisation in Hong Kong.

Commentary and Contributions

Previous dissertations and reports only review the literature of locational factors of office decentralisation. Common examples are from Kwan (1990), Liu (1992) and Wong (2000). The findings are not persuasive enough to reflect the case in Hong Kong because the factors may vary in different geographical environments and different cultures. This literature review is different from
others as it includes not only locational factors but also a broad range of office
decentralisation theories, which may be applied to Hong Kong and may be
used to predict the future trend of decentralisation.

From the literature review, office decentralisation research lacks a reliable
theoretical basis. Most of the theories and models are developed by
conducting surveys, except the equilibrium model by Clapp (1984). The
famous statement “Office location research relies heavily upon an empirical
rather than a theoretical base.” by Goddard (1975) actually implies a blemish
in the perfect work in this field of research.
2.4 Impact of Office on Residential Property

The earliest monocentric model of city developed by Alonso (1964) shows that the land price in CBD is the highest, provided that only one single employment node located at the city centre (CBD). The bid-rent depends on the accessibility to the CBD. Accessibility can be represented in terms of distance to work and transportation costs, including commuting expenses and travelling time to workplace.

With the monocentric assumption, Mok, et al. (1995) use distance-to-CBD as the variable to show a significant negative property price gradient.

Without using the monocentric assumption, Dubin & Sung (1987) demonstrate a polycentric model that there are subcenters which can also exert similar influences on property values as the CBD does.

No matter monocentric or polycentric assumption is employed, many scholars can show significant impact of CBD or office nodes on properties by using the price or rent gradient. It is obvious that, with other things being constant, the nearer to CBD or sub-centre, the higher the value of residential properties.

In a micro sense, Thibodeau (1990) estimates the effect of one high-rise
office building on the value of houses in a town in U.S.. The results indicate that the office building introduced both positive and negative externalities to the residential neighbourhood. The accessibility to workplace increases and people may also bid up land prices in anticipation of further development. On the other hand, the visual intrusion and increased traffic congestion pose negative effects. The office building has negative net effect on properties just adjacent to it (within 1000m from the office), but positive net effect on houses located between 1000m and 2500m away, and no effect on houses located 2500m away.

Commentary and Contributions

All the above regression analysis dealing with CBD, office node or office only concerns the proximity effect after completion of the office buildings. They ignore the anticipation effect or expectation effect before the office building is developed. As Muth (1961) states in his rational expectation model that people would base their forecast on all of the information available rather than simply on past information. Though there are many researches on the effect of CBD, office node or office, still very few of them deal with both the expectation effect and the actual effect. Many people neglect the on-going change in effect when
an additional commercial building is developed in a decentralised office region.

Another common problem is the assumption that every floor in the same residential buildings shares the same degree of impact. It is because of the assumption that different floors in the same building have the same horizontal proximity to office and the lift travelling time is zero. However, differences in the vertical floor level of the residential building may receive different degrees of impact.

Although there are some studies which investigate the effect of sub-centres on properties with non-monocentric or polycentric assumption, the direct relationship between office decentralisation and residential properties has not been studied before. Therefore, there is research merit to investigate the impact of office decentralisation on nearby residential properties in terms of time and floor levels.
2.5 Summary

The main ideas of previous related literature are summarized in Table 2.3, Table 2.4 and Table 2.5.

Table 2.3: Summary of literature review on office location research

<table>
<thead>
<tr>
<th>Office Location Research – Normative Equilibrium Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author</strong></td>
</tr>
<tr>
<td>(Von Thünen, 1826)</td>
</tr>
<tr>
<td>(Alonso, 1964)</td>
</tr>
<tr>
<td>(Muth, 1969)</td>
</tr>
<tr>
<td>(Solow, 1973)</td>
</tr>
<tr>
<td>(White, 1976)</td>
</tr>
<tr>
<td>(Clapp, 1983a)</td>
</tr>
<tr>
<td>(Tauchen &amp; Witte, 1983)</td>
</tr>
</tbody>
</table>
location. It proposes that the equilibrium model of office location is different from industrial location theory.

<table>
<thead>
<tr>
<th>Author</th>
<th>Main Idea</th>
<th>Critique / Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sullivan, 1986</td>
<td>The city centre is occupied by the officer sector, and the office sector is subject to agglomerative economies arising from the need for face-to-face contact. Residents choose between two employment areas: centralized office sector and decentralized manufacturing sector. It is used to explore the general equilibrium effects of zoning policies.</td>
<td>Agglomeration economies are considered. Can be used to study a city with sub-centre of decentralised employment.</td>
</tr>
</tbody>
</table>

**Office Location Research – Behavioural Approach**

<table>
<thead>
<tr>
<th>Author</th>
<th>Main Idea</th>
<th>Critique / Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fernie, 1977</td>
<td>“Programme” contacts are locational flexible and more susceptible to decentralisation. Face-to-face contact is the most important indicator to assess the role of communication in location choice. The main factors related to the advantages of centrality are suggested.</td>
<td>Provide variables for development of office location model.</td>
</tr>
<tr>
<td>Pye, 1977</td>
<td>Accommodation and salary savings are compared with increase in travel costs in maintaining contacts. The greatest savings is useful to analyse policy concerning travel and communication cost.</td>
<td></td>
</tr>
</tbody>
</table>

Study of firm distribution inside CBD only.
obtained by a common move from London to outer South East. Offices are less likely to move to assisted areas, due to inadequate incentives to cover costs in maintaining contacts. Can be used to study office relocation decision.

(Pye, 1979) 40% of meetings are replaced by teleconferences, but it cannot significantly change the trade-off between communication costs and other savings. Shows the importance of face-to-face contacts, which cannot be replaced at that time in UK.

(Alexander, 1979) By combining the results of questionnaire surveys conducted by other scholars, it summarises the factors drawing offices to central location in different cities. Office activities cluster together in city centres mainly because of need for direct personal contact in business transactions and information exchange. Shows the importance of direct personal contact for office locations. Definition of office jobs is too specific.

(Edwards, 1983) The process model has two phases (decision to relocate and choice of new premises) with seven steps. It explains the location choice of service-sector institutions. The process is a looped cycle that the seven steps repeat again and again. Helps understanding the process of decision making, but still lacks precision.
Office Location Research – Combination of both Approaches

<table>
<thead>
<tr>
<th>Author</th>
<th>Main Idea</th>
<th>Critique / Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Clapp, 1993)</td>
<td>It combines both the equilibrium and behavioural approaches, and use economic theory to identify and describe five major factors influencing office locations. The factors can be used as a framework for evaluating location decisions. Location quotient and growth quotient are invented to incorporate the behavioural approach into the neoclassical model for testing the hypothesis.</td>
<td>A generalization of both approaches. More comprehensive than using either approach.</td>
</tr>
</tbody>
</table>


Table 2.4: Summary of literature review on office decentralisation research

<table>
<thead>
<tr>
<th>Office Decentralisation Theories – Global Context</th>
<th>Author</th>
<th>Main Idea</th>
<th>Analysis Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Clapp, 1984)</td>
<td>The model departs from the traditional NUE model. CBD is replaced by an economic agent, which makes the CBD endogenous. Relocation cost is added to the bid-rent function, and equilibrium is no longer unique. The agent continues to occupy that location until the net savings of relocation is greater than the relocation cost. Increase in demand causes increase in the production level for interdependent agents and needs new spaces. This helps explain the evolution of sub-centre.</td>
<td>Equilibrium</td>
<td></td>
</tr>
<tr>
<td>(Clapp, 1983b)</td>
<td>The effect of office decentralisation is measurable based on the assessment of total transportation costs involved before and after decentralisation. It is called “communication damage”, which is defined as the extra travel costs, including time, needed to maintain the same level of contacts.</td>
<td>Cost and Benefit</td>
<td></td>
</tr>
<tr>
<td>(Rhodes &amp; Kan, 1971)</td>
<td>Opinion survey of decentralised firms is conducted to study actual office relocation.</td>
<td>Survey of factors</td>
<td></td>
</tr>
</tbody>
</table>
Results show that office users consider the following main criteria to determine new location choice: the effect on the operating costs of the office activities moved and the transitional costs involved; the effect on the way in which resources are used; additional social effects; and the effect on communication links and any resulting change in operational efficiency and productivity.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Goddard, 1975)</td>
<td>It broadly summarises the effects of relocation on office communications in three ways. Transferability is the possibility of transferring city centre contacts to the new locality. Substitutability is the possibility of transferring city centre contacts that have not been replaced locally to telecommunication. Transfers and substitutability are both a consequence of the way the functions of the organization change as a result of decentralisation.</td>
</tr>
<tr>
<td>(Goddard &amp; Morris, 1976)</td>
<td>Offices that have already decentralised or have decided to move in the near future have made rational location decision at least with respect to communication factors. Routine, short or frequent functions are more likely to be relocated.</td>
</tr>
<tr>
<td>(Gad, 1979)</td>
<td>Linkage intensity and the spatial concentration of meeting partners are the two major measurable criteria used to judge the locational flexibility. Low linkage</td>
</tr>
</tbody>
</table>

Survey of communication
Survey of industries
<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gad, 1985</td>
<td>There are different phases of suburban office growth and the order is according to specific industries. First phase is about the establishment of small offices servicing the newly emerging suburban customers. Then, it is followed by sales offices, manufacturing head offices, engineering consultants and architects, insurance, investment and accounting. The final phase involves the partial decentralisation of large clerical work force.</td>
<td>Survey of industries</td>
</tr>
<tr>
<td>Smith &amp; Selwood, 1983</td>
<td>There are marked sectoral differences in decentralisation. Government and professional services tend to be strongly centralised; financial, insurance, real estate, and business service offices are more decentralised. The distance from the central area is highly related to the density of office floor space, although it is declining in importance.</td>
<td>Regression</td>
</tr>
<tr>
<td>Kutay, 1986</td>
<td>50 large firms are surveyed to examine the effect of telecommunications technology on office location and develop a model of factors influencing decentralisation. Office decentralisation is a function of influence level of</td>
<td>Survey of firms Regression</td>
</tr>
</tbody>
</table>
telecommunications technology and the type of industry. Diseconomy of CBD is not a significant driving factor in decentralisation.

(Alexander, 1979) Results of other surveys are compared in order to summarise the factors of relocation. Office jobs of a lower status may not need proximity to other offices while those of higher status needs. It also mentions other factors affecting firms in considering their relocation.

<table>
<thead>
<tr>
<th>Office Decentralisation Theories – Hong Kong Context</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author</strong></td>
</tr>
<tr>
<td>(Lai, 1995)</td>
</tr>
<tr>
<td>(Han, 1999)</td>
</tr>
</tbody>
</table>
trades continued to occupy the non-CBD area. Solicitor and stock exchange continue to concentrate in the CBD. Finance is not determinable as to whether it favours decentralisation or centralisation.

| (Wong, 2000) | Five factors of office decentralisation in Hong Kong are identified: availability of office space, congestion, staffing problem, change in economy and improvement in technology. Yuen Long New Town has potential to become a minor office node in the future. | General Survey |
### Table 2.5: Summary of literature review on impact of office on residential property

<table>
<thead>
<tr>
<th>Author</th>
<th>Main Idea</th>
<th>Critique</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Mok, et al., 1995)</td>
<td>Monocentric assumption is adopted. Distance-to-CBD is used as the variable to show a significant negative property price gradient.</td>
<td>Only consider proximity effect. Anticipation effect is not considered. Assume every floor in the same residential buildings shares the same degree of impact.</td>
</tr>
<tr>
<td>(Dubin &amp; Sung, 1987)</td>
<td>Polycentric assumption is adopted. Results show that subcenters can also exert similar influences on property values as the CBD does</td>
<td>Only consider proximity effect. Anticipation effect is not considered. Assume every floor in the same residential buildings shares the same degree of impact.</td>
</tr>
<tr>
<td>(Thibodeau, 1990)</td>
<td>The effect of a high-rise office building on the housing value in a U.S. town is estimated. The office building introduces both positive</td>
<td>Only consider proximity effect. Anticipation effect is not considered.</td>
</tr>
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</tbody>
</table>
and negative externalities to household. Positive effect is the increase in accessibility and the bid up in land prices due to anticipation of further development. Negative effect is visual intrusion and increased traffic congestion. The net effects on house values vary in different distances from the office building.
CHAPTER 3

OFFICE DECENTRALISATION IN HONG KONG

Since the literature review only provides a fundamental theoretical framework of office location and office decentralisation, it is not sufficient to show the market trend of office decentralisation in Hong Kong. Practitioners’ reports and government statistics should be incorporated in order to reflect the reality in Hong Kong.
3.1 Definition of Terms

Central Business District (CBD)

“While the CBD is a widely used term denoting an area of intense business activities, it is technically difficult to be demarcated in any precise manner because of the constant change in development patterns and the mix of land uses at the peripheries.” (Planning Department, 2008) In different decades, the definition of CBD differs. In 1980s, it was obvious that only Central district is the CBD. Due to expansion, the scope of CBD expands.

Nowadays, even different departments in Hong Kong Government have slightly different interpretations in the definition of CBD in their published documents. In recent years, the Rating and Valuation Department defines the “Core Districts” of Hong Kong as the traditional office districts of Central, Wanchai, Causeway Bay, Sheung Wan and Tsim Sha Tsui. Besides, the Planning Department follows this direction and defines these districts as the CBD. Other than these five district, the part of West Kowloon Reclamation lying south of Jordon Road has also been included as it is a natural extension of the existing and planned high-grade office developments at the Harbour City and Airport Railway Kowloon Station.
In this dissertation, the most updated definition of CBD by the Planning Department is adopted. In short, CBD in Hong Kong now includes Central, Wanchai, Causeway Bay, Sheung Wan, Tsim Sha Tsui and the West Kowloon Reclamation.

**Office**

According to the Rating and Valuation Department (2008), “Private Office” premises comprise premises situated in buildings designed for commercial/business purposes. Excluded are non-domestic floors in composite buildings. Offices are graded as follows:

- **Grade A** - modern with high quality finishes; flexible layout; large floor plates; spacious, well decorated lobbies and circulation areas; effective central air-conditioning; good lift services zoned for passengers and goods deliveries; professional management; parking facilities normally available.

- **Grade B** - ordinary design with good quality finishes; flexible layout; average-sized floor plates; adequate lobbies; central or free-standing air-conditioning; adequate lift services, good management; parking facilities not essential.
Grade C - plain with basic finishes; less flexible layout; small floor plates; basic lobbies; generally without central air-conditioning; barely adequate or inadequate lift services; minimal to average management; no parking facilities.

It should be noted that location is not a feature used in classification of grade. Offices owned by the Government of the Hong Kong Special Administrative Region and managed by the Government Property Agency are excluded.

Since the above benchmark is abstract and not measurable, Jones Lang LaSalle (2005) sets a more concrete benchmark on Grade A offices, and further classifies the existing Grade A offices into three sub-segments, A1, A2 and A3. It aims to provide additional information on the differential performance of the three sub-segments and better understanding of the dynamics of the market.
Office Decentralisation

In the late 1980s, the CBD was defined as Central district only. At that time, office decentralisation was defined and it consisted of two stages, primary decentralisation and secondary decentralisation. Primary decentralisation is the short-distance office relocation from Central to secondary office centres which are adjacent to Central. The districts include Sheung Wan, Wanchai, Causeway Bay and Tsim Sha Tsui. Secondary decentralisation refers to the relocation to the decentralised office nodes.
beyond Central. They include North Point, Quarry Bay, Tsuen Wan and
Cheung Sha Wan. (Kwan, 1990; Walker & Green, 1990)

As Hong Kong has been undergoing primary decentralisation for about 20
years already, the CBD is now extended to Sheung Wan, Wanchai, Causeway
Bay, Tsim Sha Tsui and part of West Kowloon Reclamation.

In this dissertation, the definition of office decentralisation refers to the
"secondary decentralisation" only.

Internal Floor Area (IFA)

It is defined as the area of all enclosed space of the unit measured to the
internal face of enclosing external and/or party walls. Depending on the design
of individual office building, the IFA may account for 50% to 70% of the GFA.

(Rating and Valuation Department, 2008)
3.2 Office Market in Hong Kong

The office market in Hong Kong can be illustrated with reference to the documents in the planning study “Hong Kong 2030 Planning Vision and Strategy” (Planning Department, 2008). The Planning Department made use of the information compiled by the Rating and Valuation Department as well as consultants’ assessment reports to describe the past trends and predict the future office market.

First, Figure 3.2 shows that the total stock of Grade A offices increased rapidly from 1991 to 2006.

Figure 3.2: Territorial Stock of Grade A Offices

(Source: Planning Department, 2008, No. 46 p. 3)
Figure 3.3 shows the supply, take-up and vacancy of Grade A offices from 1991 to 2006. The supply of Grade A offices is higher in the 1990s, and then decreases sharply in 2000-2006 mainly as a result of the economic downturn. The level is the lowest in 2005. Similarly, the demand for Grade A offices has also been dispersed as reflected by the sharp fluctuations in the vacancy rates. The vacant floor area in 1998 is 800,000 m² IFA, which is almost five times of that in 1993. The take-up volume is surprisingly low in 2002 and unpredictably high in 1999.

Figure 3.3: Supply, Take-up and Vacancy of Grade A Offices

(Source: Planning Department, 2008, No. 46, p. 4)
The proposed demand for CBD Grade A offices is assessed, and it is projected to increase from 4,100,000 to 6,700,000 m² GFA. After considering the surplus stock and natural vacancy, the net total requirement of CBD Grade A offices is expected to be 2,700,000 m² GFA in 2030 as shown in Table 3.1.

Table 3.1: CBD Grade A Office floor space Demand and Requirement

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>Increase 2003-2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>4.1</td>
<td>5.1</td>
<td>5.8</td>
<td>6.7</td>
<td>2.6 million m²</td>
</tr>
<tr>
<td>Requirement (Demand – Surplus Stock + Vacancy)</td>
<td>4.7</td>
<td>5.6</td>
<td>6.4</td>
<td>7.4</td>
<td>2.7 million m²</td>
</tr>
</tbody>
</table>

(Source: Planning Department, 2008, No. 46, p. 1)
3.3 Trend of Office Decentralisation in Hong Kong

The dominant position of CBD is shown in Figure 3.4. The supply of Grade A offices concentrates in the CBD and the vacancy rate of CBD is much lower in any given year, and with less fluctuation, than offices outside CBD.

Figure 3.4: Stock and Vacancy of Grade A Offices Within and Outside the CBD

(Source: Planning Department, 2008, No. 46, p. 5)

However, a more obvious phenomenon is the trend of office decentralisation from 1991 to 2006. The supply of Grade A offices outside CBD increases by 4.4 times. The Planning Department (2008) indicates that the growth of office nodes is attributed to good accessibility provided by railway.
CHAPTER 3
OFFICE DECENTRALISATION IN HONG KONG

and the fact that land is held under single ownership with unrestricted lease.

In addition, the market researches done by Jones Lang LaSalle (2006) examines the geographical distribution of Grade A offices in 1985 and 2005, as shown in Figure 3.5. The rapid growth in offices and the decentralisation of office location choices can be clearly seen.

Figure 3.5: Rapid growth in Grade A office market over the last 20 years

(Modified from source: Jones Lang LaSalle, 2006, pp. 6-7)
3.4 Government Involvement in Office Decentralisation

Hong Kong government first involved in office development strategies in the 1980s. Later on, the Planning Department (1999) continues to revise office land development strategy and issued the “Study on The Propensity for Office Decentralisation and the Formulation of an Office Land Development Strategy”. The objective of the study is “to identify the trends and key factors in determining the locations of office centres, and formulating a planning strategy for commercial and government office locations for 2011”.

They suggest three major local office location determinants: good accessibility by railway, agglomeration economies with a minimum office floor space of 500,000m$^2$ GFA, and low occupancy costs. Then, four strategy themes, namely centralisation, minor decentralisation, major decentralisation and dispersal, are discussed. The conclusion is that combination of minor and major decentralisation is the most appropriate strategy, and the key implementation mechanisms are suggested to be rezoning or upzoning.

Recently, another planning study is the “Hong Kong 2030 Planning Vision and Strategy” (Planning Department, 2008). It aims at setting out directions for the spatial development to meet the challenges of the future, including working
out a planning strategy of Grade A offices. Consolidating the existing CBD alone hardly meet all the future demand for Grade A office spaces, while decentralisation alone cannot satisfy the planning criteria in terms of agglomeration. Therefore, a hybrid of consolidation and decentralisation is adopted.

The proposed strategy is shown in Figure 3.6. Private sectors have already initiated to develop office node in Quarry Bay, and the West Kowloon Reclamation cluster will be developed very soon. In the medium to longer term, the former Kai Tak Airport site will be planned for development of new office node.

Figure 3.6: Proposed strategy for Grade A offices

(Source: Planning Department, 2008, No. 46, p. 12)
Decentralised office nodes are not only limited to these three areas as many developers are planning to build Grade A office buildings in other areas like Kowloon Bay and Kwun Tong.
3.5 Impact on Neighbourhood Residential Property

New offices buildings in decentralised office nodes add convenience to nearby residents as the distance to work is significantly reduced and the accessibility is increased. However, this effect may be more psychological than factual. It is because not all the residents in that area can move their working places to the new office buildings and enjoy the benefits. But the psychological effect still bids up the property prices and the anticipation effect may be exaggerated. That is why it is necessary to investigate both the expectation effect and the actual effect. People may have different views on the impact at different stages.

Another positive effect is the bidding up in property prices due to the anticipation of further commercial development. It is obvious for residents nearby to observe that their living places will gradually become an office node. Hence they may anticipate further commercial development in the future and bid up the property price in the market.
For the possible negative effects, some residential flats directly facing the office building may suffer serious visual impact as their views are blocked. In addition, if the office building is a skyscraper, the sky view of many flats in upper floors may also be affected.

After completion of decentralised office building, it may increase traffic congestions, which increase transportation time and reduce accessibility. Another projection is that more people share the public facilities in the estate, for example, parks, podium gardens, etc. Both problems contribute to the consequence of a noisier environment, especially for lower floors.

The above suggestions imply that the impact on residential properties varies in different time for different floors. Whether the net effect is positive or negative is subject to testing of hypothesis.
In order to investigate the possible impact of office decentralisation on nearby properties, the hypotheses are established as follows:

1. Office decentralisation has positive impact on the neighbourhood residential properties, in both the post-announcement stage and the post-completion stage.

2. Office decentralisation has a less positive impact on the lower floors of neighbourhood residential properties, in both the post-announcement stage and the post-completion stage.

Office decentralisation is a long process that involves a number of new office buildings established in the decentralised region. There may be multiple effects of several office buildings on the nearby residential property market. For the sake of simplicity and precision, only the impact of one additional decentralised office building will be studied, and the multiple effects of other offices can be avoided in this research. Hedonic price model is adopted to test the two hypotheses.
CHAPTER 5

RESEARCH METHODOLOGY

To investigate the impact of a decentralised office on the property market, hedonic price model is used. In this research, property price, instead of price gradient, is chosen to indicate the effect of office decentralisation on the nearby residential property market.

Hedonic price model is used to measure the single effect of a decentralised grade A office building on nearby residential property price. Both the expectation effect and the actual effect are measured to test the first hypothesis. Then, higher and lower floors are taken into account to test the second hypothesis.
5.1 Concept of Hedonic Price Model

A study by Court (1939) is often cited as the beginning of hedonic models, although the study actually investigates the automobiles market, not the housing market. “Court (1939) is often viewed as the father of hedonic modeling, but earlier studies that examined the value of farmland date back to Haas (1922) and Wallace (1926). Later studies developed the microeconomics foundation for estimating the value of utility-generating characteristics (Lancaster, 1966) and nonlinear hedonic pricing (Rosen, 1974).” (Sirmans, Macpherson, & Zietz, 2005)

Hedonic prices are defined as “the implicit prices of attributes and are revealed to economic agents from observed price of differentiated products and the specific amounts of characteristics associated with them”. (Rosen, 1974) In another words, Rosen (1974) states that hedonic price model is a multiple regression of the price of a heterogeneous good on its characteristics.

Hedonic regression analysis is typically used to estimate the marginal contribution of individual housing characteristics (Sirmans, et al., 2005). The coefficients triggered from the hedonic price model are interpreted as the shadow price of these characteristics which indicated their implicit value.
Housing is a typical example of applying hedonic price model as the property price is not only affected by a single factor, but by different factors, e.g. age, floor level and sizes. (Heikkila, Gordon, Kim, Peiser, & Richardson, 1989)

Rosen (1974) states that the observed product prices and the specific amounts of characteristics associated with each good define a set of implicit or 'hedonic price'. That means the price of any heterogeneous good is a function of the levels of characteristics associated with the product. The markets of a class of commodities are described by different attributes or characteristics.

Rosen considers housing as a vector of characteristics that directly relates to consumers’ utility function or satisfaction. The hedonic price model links the price and a bundle of attributes together to make a functional relationship:

\[ P(z) = f(z_1, z_2, \ldots, z_n) \]

where \( P(z) \) is the observed price in market, and \( z \) stand for the level of characteristics contained in vectors. The price of any attributes, \( n \), contained in \( z \) is referred to as the implicit price of the attribute.
5.2 Housing Attributes in Hedonic Price Model

Since property is composed of the implicit prices of housing attributes, it is important to know which housing attributes should be incorporated into the hedonic price model. Bulter (1982) states that all characteristics relevant to the determination of market price, i.e. those that both yield utility to residents and are costly to produce, should be included.

After many years of researches, the housing attributes are generally categorized into structural, location and neighbourhood characteristics. Therefore, the hedonic price model can be modified as follows:

\[ P = f(S, L, N) \]

where

\( S \) is Structural Characteristics;

\( L \) is Locational Characteristics; and

\( N \) is Neighbourhood Characteristics
Structural Characteristics

Structural characteristics relate to the building structure of the property. Kain and Quigley (1970) illustrate a bundle of residential services has much effect on its price. The number of rooms, the number of bathrooms, the lot size, the orientation and also the residential qualities are found to have impact on the prices.

There is a major difference between overseas and local research studies in terms of structural characteristics. Overseas studies incorporate a wide variety of structural features in the model. Typical example is the research done by Grether & Mieszkowski (1974). The variables include tile baths, volts, fireplace, bathrooms, toilets, number of stories, condition of houses, volts and slate roof etc.

In contrast, local studies mainly focus on building age, floor level, area, etc. as the significant independent variables. Mok, et al. (1995) demonstrates that property in higher floor level with larger area has a higher price. Chau, et al. (2001) study on the superstitious effect that people are willing to pay a premium for a lucky floor number, especially during property booms.
Locational Characteristics

Locational characteristics relate to the geographical location of the property as well as its accessibility to the central business district (CBD), social and civic centres, shopping malls, subway stations, etc.

In a macro sense, the earliest monocentric model (Alonso, 1964) shows that the land price in CBD is the highest, provided that only one single employment node located at the city centre (CBD). It is due to the shortest distance to work and the lowest transportation costs. It is the origin of the famous bid-rent curve. Later on, Dubin & Sung (1987) demonstrate a polycentric model that there are subcenters which also exert similar influences on property values as the CBD does. Without concerning the monocentric or polycentric assumption, Chau & Ng (1998) also confirm that the improvement of public transportation efficiency can reduce the difference in property prices between two railway stations.

In a micro sense, a sea view is regarded as a type of residential amenities and an important characteristic for properties in Hong Kong. Benson, et al. (1998) estimate the impact of different types of scenic views and different qualities of views on residential properties. The views include ocean, lake and mountain, and most of the results are significantly positive.
Neighbourhood Characteristics

Neighbourhood characteristics relate to the quality and nature of the neighbourhood of the property. Contrary to the monocentric model proposed by Alonso (1964), Kain and Quigley (1975) find that households with higher income and better education tend to live further away from the CBD for a better quality of life. It implies that property price is determined not only by accessibility and transportation costs, but also by some neighbourhood characteristics like air pollution or other environmental factors.

Gautrin (1975) suggests that aircraft noise has significant negative impact on property price. However, on the other hand, McMillan, et al. (1980) find that quietness does add value to the property.

In Hong Kong, there are also some researches on special neighbourhood characteristics. Mok, et al. (1995) show that big estate and entertainment/sport facilities have a positive effect on the neighbouring property price. Li (2005) states that the subsidized public housing estate under Home Ownership Scheme imposes a negative impact on neighbouring private housing estates, but the effect is psychological instead of physical.
5.3 Structure of Hedonic Price Model

With a proper and specific hedonic price function, the estimated coefficients can provide the estimated marginal prices of the specific characteristics. If the relationship is linear, then:

\[ P = c + \sum_i \alpha_i S_i + \sum_j \beta_j L_j + \sum_k \gamma_k N_k + \epsilon \]

where,
\[ P \] = Individual property price
\[ S_i \] = Variables representing structural characteristic \( i \)
\[ L_j \] = Variables representing locational characteristic \( j \)
\[ N_k \] = Variables representing neighbourhood characteristic \( k \)
\[ \alpha_i, \beta_j, \gamma_k \] = Coefficients of the corresponding variables
\[ c \] = constant term
\[ \epsilon \] = stochastic or error term

The partial derivative of the above hedonic function with respect to any attributes is the marginal change in the valuation of the property, ceteris paribus (Rosen, 1974).

\[ \frac{\Delta P}{\Delta S_i} = \alpha_i \quad \frac{\Delta P}{\Delta L_j} = \beta_j \quad \frac{\Delta P}{\Delta N_k} = \gamma_k \]

That means, holding other things constant, one unit changes in the housing attribute \( S_i, L_j \) and \( N_k \) will make \( \alpha_i, \beta_j \) and \( \gamma_k \) units change in \( P \) respectively.
After setting up the equation, regression analysis is used to examine the relationship between dependent and independent variables. By using the Ordinary Least Square (OLS) method, the best-fit line of the equation can be found and the coefficients can be calculated. The rationale of OLS is to estimate the true but unobservable function by minimizing the residual sum of squares of the difference between the actual and the forecast values of $P$. 
5.4 Choice of Functional Form

To determine the correct specification of hedonic relationship, not only the correct variables should be included, but also a correct functional form should be chosen. In the empirical results of Linneman (1980), there is 86% overestimation obtained from his hedonic property valuation due to the misspecification of functional form. Therefore, the choice of a suitable functional form must not be neglected, and it depends on the following two situations:

1. A prior knowledge of the nature of the relationship between the dependent variable and the independent variables can be logically deduced, or
2. No prior information is available

In the first case, the functional form will be the one that assumes the already established relationship. In the second case, it is necessary to apply trial and error based on empirical observations, and the more flexible functional forms will be tested against the linear form. In practice, linear function will be assumed first. If it is not suitable, a Box-Cox transformation (Box & Cox, 1964) is performed.
Box-Cox transformation

It is a very flexible functional form that can approximate most positive continuous functions when there is no prior functional form available. It has been widely adopted in estimating the hedonic price models of Linneman (1980), Megbolugbe (1989), Mok, et al. (1995), Chau & Ng (1998) and Chau (1999).

The linear relationship between property price and the housing attributes is in the following general form:

\[ P = c + \sum_i \alpha_i S_i + \sum_j \beta_j L_j + \sum_k \gamma_k N_k + \epsilon \]

By using Box-Cox transformation, it is transformed into the following:

\[ P^* = c + \sum_i \alpha_i S_i^* + \sum_j \beta_j L_j^* + \sum_k \gamma_k N_k^* + \epsilon \]

where,

\[ P^* = \frac{P^{\lambda_i} - 1}{\lambda_i} \quad S^* = \frac{S^{\lambda_2} - 1}{\lambda_2} \quad L^* = \frac{L^{\lambda_3} - 1}{\lambda_3} \quad N^* = \frac{N^{\lambda_4} - 1}{\lambda_4} \]

\[ \lambda_i \geq 0 \quad \text{for } i = 1, 2, 3, \text{ or } 4 \]

The Box-Cox specification can be linear (when all \( \lambda_i = 1 \)), logarithm-linear (when all \( \lambda_i = 0 \)), or semi-logarithm (when all \( \lambda_i = 0 \) except \( \lambda_4 = 1 \)), etc.

The power factors \( \lambda_i \) and the coefficients are estimated using Maximum Likelihood Estimation (MLE) technique. The iterative procedures described in
Berndt, et al. (1974) is adopted. The dummy variables in the model cannot be transformed because the transformation can only be performed on variables that are strictly positive (Chau & Ng, 1998).

Megbolugbe (1989) states that the power factors $\lambda$ can be interpreted as an indicator of how constrained a housing market is. When $\lambda \approx 1$, the market is in static equilibrium. When $\lambda \approx 0$, the market is in stable equilibrium. When $\lambda > 1$, the market is loosen. When $\lambda < 0$, the market is tight. The intensity of looseness or tightness can be indicated by the absolute value of $\lambda$ (Megbolugbe, 1989). Mok, et al. (1995) summarize the values of $\lambda$ in the U.S., Tokyo, Cali and Nigeria from other empirical studies.

**Functional form of this research**

It is no doubt that the Box-Cox transformation is a very flexible functional form, but researchers doubt its effectiveness. From the empirical results by Mok, et al. (1995), the regression coefficients in the Box-Cox specification are effectively the same as those in the linear specification. That means there is no significant difference between the two. Moreover, Gordon & Richardson (1982) criticize that there is no clear evidence to support that linear specification is inferior to other alternative specifications. Therefore, there is no perfect
method to choose a definitely correct functional form for the hedonic price model.

Based on the findings from the studies by Linneman (1980), Gordon & Richardson (1982), Megbolugbe (1989), Mok, et al. (1995) and Chau & Ng (1998); it is decided to use the semi-logarithm function in this research. The logarithm transformation will be applied to the dependent variable to avoid the potential of heteroscedasticity.

\[
\ln P = c + \sum_i \alpha_i S_i + \sum_j \beta_j L_j + \sum_k \gamma_k N_k + \epsilon
\]

In this case, the coefficients represent the percentage changes in the price \( P \) with respect to each unit increase in the housing attributes \( (S_i, L_j, N_k) \).

\[
\frac{\Delta P}{\Delta S_i} \times \frac{1}{P} = \alpha_i \quad \frac{\Delta P}{\Delta L_j} \times \frac{1}{P} = \beta_j \quad \frac{\Delta P}{\Delta N_k} \times \frac{1}{P} = \gamma_k
\]

Moreover, semi-logarithm function also produces a much smaller Akaike criterion (AIC), Schwarz criterion (SC) and sum of squared residues (SEE) estimates than linear and logarithm-linear functions (Yiu & Wong, 2005).
5.5 Statistical Interpretation

After establishing the hedonic price model in a correct functional form, the testing of results is equally important. The three main statistic approaches, t-statistic (t), F-statistic (F) and coefficient of determination ($R^2$), are adopted to test the empirical results of this research.

**t-statistic (t)**

It is used to test the significance of the effect of each independent variable on the dependent variable $P$. The significance level is the probability of deciding to reject the null hypothesis. If the result is unlikely to have occurred by chance, it is statistically significant. However, significance is not related to the magnitude of the effect of independent variable on $P$.

The t-statistics is calculated according to the following formula (Kahane, 2008):

$$ t = \frac{b - h}{se(b)} $$

where,

$b$ = estimated coefficient of the independent variable

$h$ = hypothesized value for the coefficient in null hypothesis

$se(b)$ = the standard error of the estimated coefficient
The larger the t-value, the more reliable is the estimated coefficient, which means the estimated coefficient is less likely to be \( h \). (In this research, \( h = 0 \).)

First, it is necessary to obtain the t-value of each independent variable \( t \) and the degree of freedom \( df \). Degree of freedom is calculated by taking the sample size and minus the number of parameters estimated. (Kahane, 2008) Then, the ‘t-distribution’ table is consulted. The table determines the probability that null hypothesis is rejected.

The relationship between \( P \) and the independent variable is significant at

\[
(1 - \alpha) \times 100\% \text{ confidence level if } |t| \geq t(\alpha, df).
\]

where,

\[
\alpha = \text{probability of null hypothesis, i.e. } b = h
\]

\[
df = \text{degree of freedom}
\]

\[
t(\alpha, df) = \text{critical value in the ‘t-distribution’ table for a given } \alpha \text{ and } df
\]

For example, \( \alpha \) is set to be 0.05, if the calculated \( |t| \) is higher than the critical value \( t(0.05, df') \), then the hedonic regression coefficient \( b \) is said to be ‘significant at the 95% confidence level’. In practice, the statistical significance is reflected in the p-value calculated. Independent variable with 0.05 or 5% level reflected in p-value is considered to be statistically significant. The larger the t-value, the smaller the p-value, the higher the probability of rejecting the null hypothesis for the variable.
Coefficient of determination ($R^2$)

The $R^2$ is a measure indicating what proportion of variation in the dependent variable $P$ is explained by the variation in the independent variables. It reflects the ‘goodness of fit’ of the functional form to the data.

The $R^2$ is defined as follows (Kahane, 2008):

$$R^2 = \frac{ESS}{TSS} = \frac{ESS}{ESS + RSS}$$

where,

$TSS = \text{Total Sum of Squares} = ESS + RSS$

$ESS = \text{Explained Sum of Squares} = \sum_i (\hat{P}_i - \bar{P})^2$

$RSS = \text{Residual Sum of Squares} = \sum_i e_i^2$

When the functional form is perfectly fit, $R^2$ equals to 1, which is the largest value. When it is completely misfit, $R^2$ equals to 0, which is the smallest value. For example, if $R^2 = 78\%$, it means that 78\% of the changes of dependent variable $P$ is due to the changes of the independent variables. The remaining 22\% of variations in $P$ is due to other unknown variables not included in the model.

No matter whether the independent variables are significant or not, as more independent variables are added to the equation, $R^2$ increases. However, adjusted $R^2$ can tackle this problem.
Adjusted $\hat{R}^2$ can be calculated as:

$$\text{Adjusted } R^2 = 1 - (1 - R^2) \frac{N - 1}{N - k - 1}$$

where,

$N = \text{number of observations / sample size}$

$k = \text{number of independent variables (excluding the constant)}$

Unlike $R^2$, adjusted $R^2$ increases only if the newly added independent variable improves the model more than would be expected by chance. It is used to measure the proportion of variance of the dependent variable explained by the variance of independent variables.

**F-statistic (F)**

It is used to test the overall significance of the hedonic price model by finding out the significance of $R^2$. The F-statistics indicates the probability that null hypothesis is true. That is, the probability that none of the independent variables helps to explain the variations in $P$.

The F-value is analogous to the t-value. The only difference is that, t-value is employed to assess the significance of each independent variable separately while F-value is used to assess the significance of the independent variables taken as a group (Kahane, 2008).
The method of F-stat is similar to that of t-stat. First, it is necessary to obtain the calculated F-value, the degree of freedom \((df)\), the level of significance \(\alpha\), and the critical value in the ‘F-distribution’ table corresponding to \(\alpha\) and \(df\).

If the calculated F-value is greater than the critical value, then the null hypothesis is rejected when \(R^2\) is statistically significant. In practice, the statistical significance is reflected in the prob(F-stat) calculated. The larger the F-value, the smaller the prob(F-stat), the higher the probability of rejecting the null hypothesis for the model. This gives additional evidence to show that the empirical result is statistically significant.
5.6 Limitations of Hedonic Price Model

Functional Form

Despite the Box-Cox transformation is a very flexible functional form, there is still no general and perfect functional form for hedonic price model.

In light of many previous empirical researches, the semi-logarithm function is adopted in this dissertation. In addition, square terms of some independent variables are added in order to capture any potential non-linear effects at an increasing or decreasing rate of change.

Multicollinearity

Multicollinearity occurs when two or more independent variables are highly correlated with each other. If this occurs, there is redundant information between the independent variables. High multicollinearity is observed when one independent variable has perfect linear relationship to one or more of the other independent variables. It will produce a negative effect on the regression results. For example, the t-value will be underestimated, or the coefficients of independent variables are difficult to be interpreted. Another common symptom is that many coefficients on its own appear to be insignificant but the
R² value is high.

If two or more independent variables look very similar in their information about the dependent variable, then the OLS procedure may not be able to distinguish the unique explanatory ability of one independent variable from the others (Kahane, 2008).

The collinear relationship among independent variables can be found by examining a correlation matrix. Another diagnosis is to examine the change in significance level before and after adding the suspected variable to the model. When the correlated variables are known, the solution to this problem is to simply drop one or more of the correlated variables.

In this research, since the independent variables in the model are chosen based on previous researches and detailed considerations, the problem of multicollinearity is already minimized.

**Heteroscedasticity**

Heteroscedasticity occurs when the variances of the error terms are not constant. It is also called ‘non-constant error variance’. One of the major causes is that some data are measured more accurately than the others. Sometimes it is caused by the variance of error terms correlating with one
independent variable. Also, it may be due to missing of certain independent variables or mis-specification of functional form. To detect the problem, examination of residual plot can be done by the White’s test.

When heteroscedasticity occurs, the estimated coefficient is still unbiased and consistent, but it is not the best linear unbiased estimator. Standard t-statistics is not applicable because the standard errors used in t-stat are not correct. In order to solve this problem, data transformation or White’s correction is performed.

In this research, all data are collected from the same housing estate, so that the units are in similar design and plan shape and they share the same facilities. The accuracy of measuring all data is nearly the same. Moreover, data transformation applied to the dependent variable, forming the semi-logarithm model would reduce the potential of heteroscedasticity.
5.7 Approaches in Previous Research

There are many studies using hedonic price model to measure the price effects of changes in land uses or improvement works. They can be divided into two types of approaches: simple hedonic price approach and price gradient approach. The prices can directly reflect the value of the properties, while the price gradient can reflect the difference in prices along a cross-sectional distance.

**Simple Hedonic Price Approach**

This approach is simply to examine the change in price triggered by one independent variable, keeping other factors constant. The variable can be a location, time, proximity, etc. They can also be an interaction term of two or more variables.

Location variable can be represented as a dummy to capture the effect of specific location, for example, location with railway transportation. However, it may also capture the effect of the specific property as well. Unlike the agricultural villages, the properties in Hong Kong possess a large degree of heterogeneity. Therefore, it is not a suitable way to use locational difference to
study the effect of one decentralised office.

Time can be expressed by a dummy to capture the price changes after the particular work is completed. Its weakness is that the time dummy also captures the effects triggered by other events happened at the same time. This is the most suitable approach to demonstrate the expectation and actual effects of a decentralised office.

Proximity effect can be examined by using a variable of distance to that particular place. If the result is significant, the price change is proportional to the distance. However, sometimes the proximity effect can not be clearly examined. It is because, along the distance, some unconsidered variables may arouse, and their effects may also be captured which would distort the proximity effect. It is a possible approach in many studies. However, in this dissertation, since the decentralised office chosen is not the first one in the district, other existing office buildings may affect the proximity effect.

**Price Gradient Approach**

The price gradient is to measure the price differences between two or more groups of properties. It is widely used by many scholars to investigate the price gradient along the distance to CBD or office nodes. However, one price
gradient can only show the effect of a fully developed CBD or office node.

There is no comparison of before and after the development.

A more comprehensive approach is the change in price gradients adopted by Chau & Ng (1998), who provide an accurate and significant result. They measured the change in price gradients to see the effect of the electrification of KCR. It shows that the public transportation improvement significantly reduces the price gradient, and the gradient represents the difference in residential prices between Sha Tin and Tai Po. Another study by Yiu & Wong (2005) also adopted the change in price gradients to demonstrate the expectation effect and the actual effect of the Western Cross Harbour Tunnel.

However, the approach of change in price gradients is only applicable for studying the effect of a single large scale development and the price gradient involves the property prices along a great distance covering two or more districts. Therefore, it is not appropriate to study the effect of one decentralised office construction, which is much smaller in scale. The approach is only suitable to study the effect of the whole office node, which is actually the multiple effects of many decentralised offices, but this is not the focus of the dissertation.
5.8 Area of Study

To investigate the hypothesis, a part of Taikoo Shing is chosen as the neighbourhood residential properties and One Island East is chosen as the decentralised office as shown in Figure 5.1.

Figure 5.1: Map of Study Area


Reasons on choosing Taikoo Shing

The district is a good area to research on the effect of office decentralisation. Near Taikoo Shing, there are a number of decentralised office buildings in the decentralised office node, Taikoo Place.

The most important reason is that Taikoo Shing is the largest private housing estate in Hong Kong, with a total of 12,308 units. Property transactions are active with a high transaction volume and high liquidity, so that the transaction prices reflect the situation of residential property market.

Another reason is the homogenous nature of the sample properties. The architectural designs of all the buildings within Taikoo Shing are similar. All the buildings have the same common facilities, for example, park, podium garden, etc. Moreover, the distance from the buildings to the MTR station is within 5 minute walking distance. Therefore, all the samples have nearly the same features. Hence, the heterogeneous nature of properties is reduced, and many structural and location variables can be ignored.
Reason on selecting part of Taikoo Shing

Only a part of Taikoo Shing is chosen because only the part nearest to the office node called Taikoo Place is selected, so as to minimise the proximity effect. The distance between One Island East and the selected residential buildings is within 5 minutes walking distance. Since the proximity effect is not our focus and will not be examined, this effect should be eliminated in order to avoid inaccurate results.

Moreover, for some of the flats directly facing the high-rise office, their views are seriously affected by the office. However, they are only the minorities which cannot reflect the general impact on the whole sample. So they are excluded from the analysis. Selection of appropriate transaction data in the selected area are discussed in details in chapter 6.

Reasons on choosing One Island East

One Island East is the latest office development in the office node, Taikoo Place. It is a single-phase Grade A office development with 69 storeys high. Among all the office buildings in Hong Kong Island East, One Island East is the office building providing the largest GFA without any retail uses. It should have a significant impact on neighbourhood residential properties, and the impact
will not be distorted by the retail element.

Another main reason is that, throughout the period of announcement, demolition and construction, there are no overlapping time periods with other office developments nearby. Since Quarry Bay is being developed into a decentralised office node, there were many overlapping periods of announcement, demolition and construction of offices in the past. Overlapping periods cause multiple effects. If other office is selected as sample, the result will include multiple effects from other offices. Only One Island East has no overlapping period with other developments. Therefore, both the expectation effect and actual effect of one single decentralised office can be found.

The diagram and table in Appendix 1 show the completion years of Grade A office buildings in Quarry Bay and Taikoo. The completion years are close to each other, except One Island East.
5.9 Model Formulation of this Research

In this research, semi-logarithm function is used as the functional form, and simple hedonic price approach is adopted with time dummies to capture the effect of decentralised office.

To test the two hypotheses, a number of equations are formed. The dependent variable is the property transaction price $P$. Table 5.1 shows the notations of independent variables that are used.

Table 5.1: Types and Notations of independent variables

<table>
<thead>
<tr>
<th>Type</th>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural attribute</td>
<td>SA</td>
<td>Saleable Floor Area of the property</td>
</tr>
<tr>
<td></td>
<td>AGE</td>
<td>Age of the building when transaction was made</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>Floor level</td>
</tr>
<tr>
<td></td>
<td>LF</td>
<td>Lucky Floor Dummy equals 1 if last digit of F is 8 and 0 otherwise</td>
</tr>
<tr>
<td></td>
<td>$F_m$</td>
<td>Dummy equals 1 for $F \leq m$ and 0 otherwise</td>
</tr>
<tr>
<td></td>
<td>$F_n$</td>
<td>Dummy equals 1 for $F \leq n$ and 0 otherwise</td>
</tr>
<tr>
<td>Locational attribute</td>
<td>SV</td>
<td>Dummy equals 1 if property has Sea View and 0 otherwise</td>
</tr>
<tr>
<td>Time factor</td>
<td>$T_i$</td>
<td>Price Index Dummy equals 1 if property transacted in the month $i$ and 0 otherwise</td>
</tr>
<tr>
<td></td>
<td>AN</td>
<td>Dummy equals 1 if property transacted after Announcement of office development and 0 otherwise</td>
</tr>
<tr>
<td></td>
<td>COM</td>
<td>Dummy equals 1 if property transacted after completion of office construction and 0 otherwise</td>
</tr>
</tbody>
</table>
Neighbourhood attributes are not included in the hedonic price model because the area for study is small and in the same housing estate. The properties share the same common facilities, so that all the neighbourhood effects are assumed to be constant.

\( \ln P - \log_e (\text{Transaction Price}) \)

The natural logarithm of transaction price is used as the dependent variable. The transaction price is the consideration of purchasing the residential flat. Since semi-logarithm function is adopted, natural logarithm is applied to the transaction price in order to eliminate possible heteroscedasticity.

It is not recommended to deflate the transaction prices by any price indices. The reason is that the available price indices are estimated from the whole territory of Hong Kong or the Hong Kong Island. The indices can only represent the general time effects of Hong Kong, but not the target district. Using this ‘external price index’ to deflate the prices in certain district is not the best approach to eliminate the time effect or inflation. A better way is to estimate the price index of the sampled properties in the hedonic price model as well. The time-induced market fluctuation in nominal price will be absorbed
into various time variables, so that an 'external' deflator is not needed. Details of price indices estimation will be discussed later. The transaction prices are obtained from the EPRC database.

**SA – Saleable Floor Area**

Flat space or size is an important factor affecting property price. Saleable floor area, in terms of square feet, is used instead of gross floor area (GFA). Although all the sampled flats have similar design, the efficiency (the percentage of living area to GFA) may still vary due to different shape or design. Moreover, purchasers concern more about the area they can use inside their flats, especially in the second hand market. Using saleable floor area would better reflect the reality and purchasers’ intention. The saleable floor area is obtained from the EPRC database, and it is expected to have a positive effect.

**AGE – Age of building when transaction was made**

When people purchase a flat, the age of building at that time is a major concern. As time goes by, there are natural deteriorations of the building. Although it is structurally safe to live in, the facilities provided become old and
perishable. Purchasers would bear the risk of paying higher maintenance and repair cost in the near future. This normal human perception gives a negative effect on property price. It is calculated by:

\[
\text{AGE} = \text{Year of Transaction} - \text{Year of Occupation Permit issued}
\]

Occupation Permit (OP) is issued when the building is fully completed. Both the transaction year and the year of OP issued can be obtained from the EPRC database.

\(F\) – Floor level

For same unit in the same building, flats at a higher storey level can enjoy a quieter environment, a less obstructed view and more sunlight. Especially when the unit faces the main road, flats at higher level would have less air pollution and traffic noise. Floor levels are obtained from the EPRC database, and, and it is expected to have a positive effect.

\(SA^2, \text{AGE}^2, F^2\) – Square terms of the variables

Square terms of the three continuous variables are used to capture any potential non-linear effects at an increasing or decreasing rate of change. For example, if the implicit price of SA increases at a decreasing rate, the
coefficient of $SA$ is positive and the coefficient of $SA^2$ is negative. The expected sign of these three square terms are unknown.

**LF – Lucky Floor dummy**

According to the empirical results by Chau et al. (2001), the lucky floor numbers 8, 18, and 28 have positive effect during the property boom period. Since his sampled properties are also from Taikoo Shing, this dummy variable of lucky floor is included to enhance the explanatory power on the hedonic price model. If the last digit of floor number is 8, then the dummy equals 1 and 0 otherwise.

Since this research does not focus on lucky floor level, no matter the transaction took place during the property boom or slump, the lucky floor dummy applies. This intangible superstition effect is expected to have a positive effect. This has been tested by Chau et al. (2001).

**SV – Sea View dummy**

According to previous literature, sea view adds a premium for properties. Since sea view is not our theme, the quality of sea view will not be further sub-divided. If the property enjoys a sea view, then the dummy equals 1 and 0
otherwise. Sea view is observed from the floor plans as shown in Appendix 2, which are obtained from the Centamap. It is expected to give a positive effect.

\[ T_i \] – Time dummies for monthly price indices

Chau, Wong, Yiu & Leung (2005) review the price index construction methodologies. One of the common methods is to compute a series of price indices from the coefficients of monthly time dummies in a single regression (Palmquist, 1980). Since the property market in Hong Kong is very volatile, change in the price level is substantial even within a short time period. To minimize the bias resulting from the indices, the time span of price index should be as short as possible. Therefore, the monthly price indices are adopted.

11 years (132 months) of transaction data are collected in order to construct reliable price indices for Taikoo Shing. The time range taken is from January 1998 to December 2008. \( T_i \) is the time dummy variable that equals 1 when the property was transacted at the month \( i \) and 0 otherwise, where \( i = 1, 2, 3, 4, \ldots, 132 \). The price indices are actually the coefficients of the time dummies. The price indices capture the time effects due to economic fluctuations and other factors like improvement works, previous commercial or
retail developments and specific information in Taikoo Shing.

It should be noted price index construction requires normalization. The method is that $T_1$ (the first month) is taken as the reference point and will not be entered into the equation. Therefore, the index for the first month is the base of the price index. In this way, ‘external’ price index is not required and the newly constructed index is more specific to the samples and provides a more accurate result. The coefficients (indices) can be positive, negative or zero subject to the time effect.

**AN – Time dummy on or after announcement**

The time dummy equals 1 on or after the date of announcement of the decentralised office development and 0 otherwise. The date of announcement is 11 June 2003. On that date, the Buildings Department published the Monthly Digest (April 2003), which showed the site getting approval of building plans. Newspapers then reported the fact immediately right after the announcement.

AN is used to investigate the expectation effect before the completion of the office building. Since people make their prediction based on all of the information available rather than simply past information, additional information is available when the official announcement is made. AN is to capture the
effect of this additional information. The expectation effect of the decentralised office can then be estimated. AN should give a positive effect. The timeline of the decentralised office development is listed in Appendix 3.

**COM – Time dummy on or after completion**

The time dummy equals 1 on or after the completion of the decentralised office development and 0 otherwise. The construction is completed in March 2008. This information can be obtained from the newspapers before actual completion, and can be verified by the Monthly Digest (March 2003) later published by the Buildings Department. It shows that occupation permit was issued to the site in March 2008. Since most of the residents aware of the information of completion, they can realize the real effect.

COM is used to investigate the additional effect after the completion of the office building. The additional effect is unknown; it can be positive or negative. The actual impact of the office should be the combination of expectation effect and additional effect reflected on the time dummy AN and COM respectively. The actual effect (effect of AN plus effect of COM) is hypothesized to be positive. The timeline of the decentralised office development is shown in Appendix 3.
AN*Fm – Interaction terms of announcement time and floor range

Previous researches assumed that every floor share the same degree of effect. However, the impact of decentralised office on different floors of residential properties may vary. Lower floors may suffer from noisier environment or more serious air pollution due to crowded people and traffic. The impact cannot be reflected on the variable F.

Therefore, the interaction term would improve the weakness of that assumption. Fm is a dummy that equals 1 if F ≤ m and 0 otherwise. This dummy is to distinguish between lower floors and higher floors at a reference level m. Value of m would be found by trial and error in the hedonic regressions. The interaction term would capture the additional effect on lower floors after the announcement of development. The additional effect should be negative.

COM*Fn – Interaction terms of completion time and floor range

This interaction term also improves the weakness of assuming same effect on all floors. Fn is a dummy that equals 1 if F ≤ n and 0 otherwise. This dummy is to distinguish between lower floors and higher floors at a reference level n, which would be found by trial and error. It should be noted that at
different stages the reference level may not be the same, so that $n$ is used instead of $m$. The interaction term would capture the additional effect on lower floors after completion of the development. This effect should be negative.
Model Formulation for the first hypothesis

To test the first hypothesis, two equations are formed:

Equation 1:  \[
\ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 \\
+ \alpha_7 SV + \alpha_8 LF + \alpha_9 AN + \sum_{i=2}^{132} \beta_i T_i + \varepsilon
\]

Equation 2:  \[
\ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 \\
+ \alpha_7 SV + \alpha_8 LF + \alpha_9 AN + \alpha_{10} COM + \sum_{i=2}^{132} \beta_i T_i + \varepsilon
\]

In both equations, all the \( \alpha, \beta \) are the coefficients to be estimated.

\( \beta \) represents the price index of the sampled properties in Taikoo Shing.
The expected results of equation 1 and 2 are shown in Table 5.2.

Table 5.2: Expected results of the model for the first hypothesis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expected Sign of the coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equation 1</td>
</tr>
<tr>
<td>F</td>
<td>+ve</td>
</tr>
<tr>
<td>F²</td>
<td>Unknown</td>
</tr>
<tr>
<td>AGE</td>
<td>–ve</td>
</tr>
<tr>
<td>AGE²</td>
<td>Unknown</td>
</tr>
<tr>
<td>SA</td>
<td>+ve</td>
</tr>
<tr>
<td>SA²</td>
<td>Unknown</td>
</tr>
<tr>
<td>SV</td>
<td>+ve</td>
</tr>
<tr>
<td>LF</td>
<td>+ve</td>
</tr>
<tr>
<td>AN</td>
<td>+ve</td>
</tr>
<tr>
<td>COM</td>
<td>Unknown</td>
</tr>
<tr>
<td>T₂ – T₁₃₂</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Model Formulation for the second hypothesis

To test the second hypothesis, the previous equations are modified.

Equation 3:  \[ \ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 + \alpha_7 SV + \alpha_8 LF + \alpha_9 AN + \alpha_{10} AN*F_m + \sum_{i=2}^{132} \beta_i T_i + \varepsilon \]

Equation 4:  \[ \ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 + \alpha_7 SV + \alpha_8 LF + \alpha_9 AN + \alpha_{10} COM + \alpha_{11} AN*F_m + \alpha_{12} COM*F_n + \sum_{i=2}^{132} \beta_i T_i + \varepsilon \]

In both equations, sensitivity analysis is adopted to estimate m and hence determine the range of lower floors. It is similar to the method of trial and error. Since the highest floor in the sample is 30, the first trial is to put m=29 and check whether AN*F_m gives a significant effect. If the effect is insignificant, then second trial is m=28. The procedure repeats until AN*F_m is significant. If AN*F_m gives a significant effect, then all the floor levels below or equal m will be the lower levels, which receive the additional effects. If AN*F_m gives insignificant effects for all m, then there will be no additional effects on lower floors, all the floors receive same degree of effect. In equation 4, after estimation of m, the same process applies again to estimate n.
The expected results of equation 3 and 4 are shown in Table 5.3.

Table 5.3: Expected results of the model for second hypothesis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expected Sign of the coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equation 3</td>
</tr>
<tr>
<td>F</td>
<td>+ve</td>
</tr>
<tr>
<td>F^2</td>
<td>Unknown</td>
</tr>
<tr>
<td>AGE</td>
<td>–ve</td>
</tr>
<tr>
<td>AGE^2</td>
<td>Unknown</td>
</tr>
<tr>
<td>SA</td>
<td>+ve</td>
</tr>
<tr>
<td>SA^2</td>
<td>Unknown</td>
</tr>
<tr>
<td>SV</td>
<td>+ve</td>
</tr>
<tr>
<td>LF</td>
<td>+ve</td>
</tr>
<tr>
<td>AN</td>
<td>+ve</td>
</tr>
<tr>
<td>COM</td>
<td>/</td>
</tr>
<tr>
<td>AN*F_m</td>
<td>–ve</td>
</tr>
<tr>
<td>COM*F_n</td>
<td>/</td>
</tr>
<tr>
<td>T_2 – T_{132}</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
6.1 EPRC Database

EPRC (Economic Property Research Centre) database keeps transaction records registered in Land Registry throughout Hong Kong. The data provider includes nearly 90% of the transaction records in Hong Kong from 27 April 1991 to present. The transaction records are obtained from Prof. K.W. Chau for the purpose of academic research.

The transaction records contain information about selling price (consideration) in HK dollars, gross floor area (GFA), saleable floor area (SA), date of transaction, date of the building obtain OP. It has practical search engines to facilitate information retrieval, so that it is easy to sort out the desired buildings for investigation.

Although EPRC database is the most reliable database of transaction records, there are still some shortcomings and abnormal transactions. First, some of the transaction prices are unreasonably low, which cannot reflect the
normal market prices. It may be due to wrong entry, such as entering rental price as selling price, or special ownership transfer to company. Moreover, there are missing or hidden data. For example, GFA or SA is missing. Another occasion is that the floor level is hidden and only marked as H/F, M/F or L/F, which means high, middle and low floor level respectively. Therefore, all these records are not suitable to reflect the residential property market and are excluded from the sample in this research.

Another selection criterion from the database is that, only the transaction records with the nature ‘sale and purchase agreement’ are chosen. Transactions with other natures are regarded as informal transactions, which will not be considered. The reason is that some of those transactions are only provisional sale and purchase, and sometimes the consideration is only a proportion of the selling price, or the records duplicate with the formal transaction records. These informal transactions will affect both the market price and the transaction volume in the market.
6.2 Centamap

The Centamap is created by referring to the survey map provided by the Lands Department, who regularly revise the official map of Hong Kong. It is an important source for searching the flats with sea view (SV). The map shows the building location and also the flat location with flat number. Moreover, floor plans of the building (attached in Appendix 2) can also be found in Centamap in order to verify the orientation of flat, structure of flat and the position of windows, etc. All these information helps to determine whether the flat enjoys a sea view.
6.3 Site Inspection

Site inspection is done in 28 January 2009 to identify the flats which have at least one window directly facing the high-rise office building. By making use of map, floor plans and observations, some of the flats were identified and excluded as the views are seriously affected. The excluded flats are marked with a red cross as shown in Figure 6.1.

Figure 6.1: Map showing excluded flats

(Modified from source: Centamap http://www.centamap.com/gc/home.aspx)

For every equation, regression analysis is used to examine the relationship between dependent and independent variables. By using the Ordinary Least Square (OLS) method, the best-fit line of the equation can be found and the coefficients can be calculated. The software, EViews 3.0, is used to process the calculation in the regression analysis.
7.1 Descriptive Statistics

Table 7.1 presents the descriptive statistics of the quantitative variables in the models. They are in terms of means, medians, maximums, minimums and standard deviations. Only quantitative variables are included as it is meaningless to show descriptions of dummy variables.

Table 7.1: Descriptive statistics of the quantitative variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Selling Price</th>
<th>Floor</th>
<th>Age</th>
<th>Saleable Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4,091,740</td>
<td>15.021</td>
<td>20.775</td>
<td>821.604</td>
</tr>
<tr>
<td>Median</td>
<td>3,780,000</td>
<td>15</td>
<td>21</td>
<td>800</td>
</tr>
<tr>
<td>Maximum</td>
<td>13,050,000</td>
<td>30</td>
<td>29</td>
<td>1408</td>
</tr>
<tr>
<td>Minimum</td>
<td>1,238,000</td>
<td>1</td>
<td>11</td>
<td>541</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1,607,616</td>
<td>7.749</td>
<td>4.581</td>
<td>165.190</td>
</tr>
<tr>
<td>Observations</td>
<td>3837</td>
<td>3837</td>
<td>3837</td>
<td>3837</td>
</tr>
</tbody>
</table>
7.2 Empirical Results of the Models

Equation 1:  \[ \ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 + \alpha_7 SV + \alpha_8 LF + \alpha_9 AN + \sum_{i=2}^{132} \beta_i T_i + \epsilon \]

Table 7.2: Empirical results of Equation 1

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>LOG(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method:</td>
<td>Ordinary Least Squares</td>
</tr>
<tr>
<td>No. of observations:</td>
<td>3837</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>0.013456</td>
<td>16.81072</td>
<td>0.0000</td>
</tr>
<tr>
<td>F^2</td>
<td>-0.000292</td>
<td>-11.48724</td>
<td>0.0000</td>
</tr>
<tr>
<td>AGE</td>
<td>-0.031631</td>
<td>-12.18311</td>
<td>0.0000</td>
</tr>
<tr>
<td>AGE^2</td>
<td>0.000431</td>
<td>6.766866</td>
<td>0.0000</td>
</tr>
<tr>
<td>SA</td>
<td>0.002282</td>
<td>22.09263</td>
<td>0.0000</td>
</tr>
<tr>
<td>SA^2</td>
<td>-4.11E-07</td>
<td>-6.647089</td>
<td>0.0000</td>
</tr>
<tr>
<td>SV</td>
<td>0.034086</td>
<td>3.444134</td>
<td>0.0006</td>
</tr>
<tr>
<td>LF</td>
<td>0.019218</td>
<td>4.207132</td>
<td>0.0000</td>
</tr>
<tr>
<td>AN</td>
<td>0.277834</td>
<td>10.08217</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>14.17583</td>
<td>260.1875</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared: 0.950895
Adjusted R-squared: 0.949049
F-statistic: 515.0389
Prob(F-statistic): 0.000000

The results of monthly time dummies for price index are omitted.

The time dummy coefficients (price index) are plotted in Figure 7.1.
Equation 2: \[ \ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 + \alpha_7 SV + \alpha_8 LF + \alpha_9 AN + \alpha_{10} COM + \sum_{i=2}^{13} \beta_i T_i + \varepsilon \]

Table 7.3: Empirical results of Equation 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>0.013456</td>
<td>16.81072</td>
<td>0.0000</td>
</tr>
<tr>
<td>F^2</td>
<td>-0.000292</td>
<td>-11.48724</td>
<td>0.0000</td>
</tr>
<tr>
<td>AGE</td>
<td>-0.031631</td>
<td>-12.18311</td>
<td>0.0000</td>
</tr>
<tr>
<td>AGE^2</td>
<td>0.000431</td>
<td>6.766866</td>
<td>0.0000</td>
</tr>
<tr>
<td>SA</td>
<td>0.002282</td>
<td>22.09263</td>
<td>0.0000</td>
</tr>
<tr>
<td>SA^2</td>
<td>-4.11E-07</td>
<td>-6.647089</td>
<td>0.0000</td>
</tr>
<tr>
<td>SV</td>
<td>0.034086</td>
<td>3.444134</td>
<td>0.0006</td>
</tr>
<tr>
<td>LF</td>
<td>0.019218</td>
<td>4.207132</td>
<td>0.0000</td>
</tr>
<tr>
<td>AN</td>
<td>0.277834</td>
<td>10.08217</td>
<td>0.0000</td>
</tr>
<tr>
<td>COM</td>
<td>-0.207155</td>
<td>-6.443851</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>14.17583</td>
<td>260.1875</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared 0.950895
Adjusted R-squared 0.949049
F-statistic 515.0389
Prob(F-statistic) 0.000000

The results of monthly time dummies for price index are omitted.

The time dummy coefficients (price index) are plotted in Figure 7.1.
Equation 3:  
\[ \ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 + \alpha_7 SV + \alpha_8 LF + \alpha_9 AN + \alpha_{10} AN^* F_m + \sum_{i=2}^{132} \beta_i T_i + \epsilon \]

After sensitivity analysis, it is found that when \( m = 6 \) (\( F \leq 6 \)), the variable \( AN^*F_m \) is significant at 5% level.

Table 7.4: Empirical results of Equation 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>0.012370</td>
<td>12.82216</td>
<td>0.0000</td>
</tr>
<tr>
<td>( F^2 )</td>
<td>-0.000265</td>
<td>-9.137625</td>
<td>0.0000</td>
</tr>
<tr>
<td>AGE</td>
<td>-0.031663</td>
<td>-12.20056</td>
<td>0.0000</td>
</tr>
<tr>
<td>( AGE^2 )</td>
<td>0.000432</td>
<td>6.781397</td>
<td>0.0000</td>
</tr>
<tr>
<td>SA</td>
<td>0.002292</td>
<td>22.17102</td>
<td>0.0000</td>
</tr>
<tr>
<td>( SA^2 )</td>
<td>-4.16E-07</td>
<td>-6.731941</td>
<td>0.0000</td>
</tr>
<tr>
<td>SV</td>
<td>0.034631</td>
<td>3.499303</td>
<td>0.0005</td>
</tr>
<tr>
<td>LF</td>
<td>0.017911</td>
<td>3.883654</td>
<td>0.0001</td>
</tr>
<tr>
<td>AN</td>
<td>0.280480</td>
<td>10.17086</td>
<td>0.0000</td>
</tr>
<tr>
<td>( AN^*F_6 )</td>
<td>-0.012234</td>
<td>-2.015484</td>
<td>0.0439</td>
</tr>
<tr>
<td>C</td>
<td>14.18067</td>
<td>260.1318</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared 0.950949  
Adjusted R-squared 0.949091  
F-statistic 511.8126  
Prob(F-statistic) 0.000000

The results of monthly time dummies for price index are omitted.

The time dummy coefficients (price index) are plotted in Figure 7.1.
Equation 4: $\ln P = \alpha_0 + \alpha_1 F + \alpha_2 F^2 + \alpha_3 AGE + \alpha_4 AGE^2 + \alpha_5 SA + \alpha_6 SA^2 + \alpha_7 SV$

$$+ \alpha_8 LF + \alpha_9 AN + \alpha_{10} COM + \alpha_{11} AN \cdot F_m + \alpha_{12} COM \cdot F_n + \sum_{i=2}^{132} \beta_i T_i + \varepsilon$$

After sensitivity analysis, it is found that when $m=5$ ($F \leq 5$), the variable $AN \cdot F_m$ is significant at 1% level. Then, when $n=2$ ($F \leq 2$), the variable $COM \cdot F_n$ is significant at 5% level.

<table>
<thead>
<tr>
<th>Table 7.5: Empirical results of Equation 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: LOG(P)</td>
</tr>
<tr>
<td>Method: Ordinary Least Squares</td>
</tr>
<tr>
<td>No. of observations: 3837</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>0.010751</td>
<td>11.40639</td>
<td>0.0000</td>
</tr>
<tr>
<td>F^2</td>
<td>-0.000221</td>
<td>-7.747287</td>
<td>0.0000</td>
</tr>
<tr>
<td>AGE</td>
<td>-0.031967</td>
<td>-12.35824</td>
<td>0.0000</td>
</tr>
<tr>
<td>AGE^2</td>
<td>0.000439</td>
<td>6.914782</td>
<td>0.0000</td>
</tr>
<tr>
<td>SA</td>
<td>0.002292</td>
<td>22.22367</td>
<td>0.0000</td>
</tr>
<tr>
<td>SA^2</td>
<td>-4.17E-07</td>
<td>-6.763857</td>
<td>0.0000</td>
</tr>
<tr>
<td>SV</td>
<td>0.035683</td>
<td>3.616721</td>
<td>0.0003</td>
</tr>
<tr>
<td>LF</td>
<td>0.016378</td>
<td>3.575978</td>
<td>0.0004</td>
</tr>
<tr>
<td>AN</td>
<td>0.282971</td>
<td>10.30416</td>
<td>0.0000</td>
</tr>
<tr>
<td>COM</td>
<td>-0.209555</td>
<td>-6.545106</td>
<td>0.0000</td>
</tr>
<tr>
<td>AN \cdot F_5</td>
<td>-0.033119</td>
<td>-5.157516</td>
<td>0.0000</td>
</tr>
<tr>
<td>COM \cdot F_2</td>
<td>-0.136457</td>
<td>-2.298829</td>
<td>0.0216</td>
</tr>
<tr>
<td>C</td>
<td>14.19682</td>
<td>260.8890</td>
<td>0.0000</td>
</tr>
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</table>

R-squared 0.951331
Adjusted R-squared 0.949474
F-statistic 512.2419
Prob(F-statistic) 0.000000

The results of monthly time dummies for price index are omitted.

The time dummy coefficients (price index) are plotted in Figure 7.1.
7.3 Interpretation on Overall Statistics

The overall performance of the four models can be seen from the adjusted R², which represents the goodness of fit, and the Prob(F-statistic).

All the four models have good explanatory power as all the four adjusted R² is near 0.95. This means that all the four models are able to explain that about 95% of the variations in property price are due to the changes in the independent variables.

Moreover, the high values of F-statistics indicate the high significance of R². The Prob(F-statistic) is 0 for all four models. It means that the probability to accept null hypothesis is zero, implying that there is no possibility to have all regression coefficients being zero.

The above statistics prove that the overall performances of the four models are satisfactory and their explanatory powers are significant.
7.4 Interpretation on Individual Attributes

$F, F^2$

For all the four models, the coefficient of floor ($F$) is positive. The floor level has a positive effect on the property price. The p-value is 0, meaning that this attribute is statistically significant at 1% level. It matches the expected results that for higher floor levels, buyers are willing to pay an extra premium for the flat.

The square term of floor ($F^2$) shows a negative sign. It means that the relationship of floor to the selling price is non-linear. When floor level increases, property price increases in a decreasing rate. $F^2$ is also statistically significant at 1% level. This result suggests when the floor level is higher and higher, the magnitude of floor effect will decrease. One of the reasons is that, the advantage of high level is enjoying better view, but the marginal gain diminishes as the floor level increases.
AGE, \(\text{AGE}^2\)

The coefficient of AGE is negative for all models, showing that age of building has a negative effect on the price. Moreover, it has a large t-value, showing the significance of this attribute. It is statistically significant at 1% level, with a zero p-value. This matches the expected result that the risk of repairing and maintenance lowers the value of property.

The coefficient of the square term (\(\text{AGE}^2\)) is positive and significant. The relationship of AGE and property price is a non-linear function. The slope of the function is negative, but the slope becomes less negative and flatter as age increase. The value of slope is actually increasing in magnitude. That is why the coefficient of \(\text{AGE}^2\) is positive. As AGE increase, property price decreases, but magnitude of decrease becomes less and less. It suggests that as the building gets older, the magnitude of age effect is less.

SA, \(\text{SA}^2\)

The coefficient of SA is positive for all models. The saleable size has a positive effect on the price. The zero p-value shows that the effect is significant at 1% level. It matches with the expected results that larger flat is worth higher price.
The coefficient of the square term of size (SA²) is negative and significant, showing the non-linear relationship of SA and property price. When saleable area increases, price increases with a decreasing rate. As the size becomes larger, the effect decreases in magnitude. As the flat is larger, the amount of premium buyers willing to pay is less. The possible explanation is that, for some very large and luxurious flats, the size becomes a less important factor relative to other factors.

**SV**

The coefficient of sea view (SV) is positive and significant. It suggests that the sea view has a positive effect on property price. The coefficient is quite large, showing the importance of this factor in Hong Kong. It matches with the expected result that sea view is a better view than other views like road or mountain. Buyers consider sea view as a benefit and thus those flats have a higher value.

**LF**

The coefficient of lucky floor (LF) is positive and significant at 1 % level. There is significant superstition effect that people consider the floor number 8
as becoming rich. Buyers like to pay more for a sound lucky floor level.

\( T_i \)

The coefficients of all the monthly time dummies are the price index of the properties. Some of the coefficients are not significant at 5% level, but it is not important. The index is based at the first month, and the index of first month is set as 1. The price indices in all the four models are plotted in Figure 7.1.

Figure 7.1: Price Indices constructed by the 4 Equations

The price indices constructed by the four equations show nearly identical trends, meaning that the price indices are consistent. The indices of Equation 1 and 3 are the same, while the indices of Equation 2 and 4 are the same.
The only difference occurs in the period of March 2008 – December 2008. It is because, in Equation 2 and 4, the variable COM captures the additional negative effect of decentralised office after completion. In Equation 1 and 3, there is no COM, so that the negative additional effect is reflected on the monthly time dummies, resulting in lower indices in this period.

**Equation 1 – AN**

In equation 1, the coefficient of time dummy AN is positive and significant at 1 % level. The coefficient is 0.277834 and the p-value is zero. It shows that right after announcement of developing the office tower, the price increases by about 27.8%. The expectation effect is reflected on the sharp increase in selling price due to this information.

Buyers may expect great improvements of the accessibility to work. Moreover, buyers may anticipate further commercial development in the district, especially in Taikoo Place. Hence, the bidding up in property prices occurs. It matches the expected result that high anticipation is triggered by the Grade A office. As stated in hypothesis 1, the decentralised office has positive impact on the neighbourhood properties in the post-announcement stage.
Equation 2 – AN, COM

In equation 2, a time dummy COM is added. The coefficient of AN is still positive and significant at 1% level. The coefficient of COM is found to be negative (-0.207155) and significant at 1% level. It shows that the price increases by 27.8% after announcement and then drops by 20.7% after completion. The actual effect of the office should be measured after completion, and it is reflected on the sum of coefficients of AN and COM. Therefore, after completion, the net percentage change in price is +7.1% (27.8%–20.7%), i.e. the property price increases by 7.1%. It matches the expected result.

The dropping back of price after completion is mainly due to the over-expectation by people. The real benefit given by the office is exaggerated. In contrast, purchasers may find that they may not actually enjoy the improvement of accessibility to work. People may find that traffic congestion is worse or the environment is noisier. There may be more people using their public facilities, for instance, the podium garden.

Despite the negative effects, the actual overall effect of the Grade A office is still positive. As stated in hypothesis 1, the decentralised office has positive impact on the neighbourhood properties in the post-completion stage.
Equation 3 – AN, AN*F₆

In equation 3, the range of lower floors is determined first. By sensitivity analysis, it is found that when m=6 (F ≤ 6), the coefficient of AN*F₆ is significant at 5% level. It means that there is additional effect of office on lower floors (F ≤ 6) right after the announcement. The negative coefficient (-0.012234) represent the additional negative effect. After announcement, for the flats on 6th floor or below, their prices only increase by 26.8% (28.0%–1.2%), there is less positive expectation impact on these flats. For the flats higher than 6th floor, their prices increase by 28.0%.

Purchasers may expect a noisier environment due to the office may affect flats in lower floors. They take this negative effect into account in the anticipation stage. Therefore, the decentralised office has a less positive impact on lower floor levels in the post-announcement stage.

Equation 4 – AN, COM, AN*F₅, COM*F₂

In equation 4, by sensitivity analysis, it is found that when m=6 (F ≤ 6), coefficient of AN*F₆ is just insignificant at 5% level. When m=5 (F ≤ 5), coefficient of AN*F₅ is significant at 1% level. Therefore, for the purpose of statistical significance, m=5 is adopted. Then, it is found that when n=2 (F ≤ 2), coefficient of COM*F₂ is significant at 5% level and negative, showing the
additional effect on lower floors after completion.

For 6/F – 30/F, the expectation effect is shown on coefficient of AN, and the actual effect is reflected on the coefficients of AN and COM. For 3/F – 5/F, the expectation effect is shown on the coefficients of AN and AN*F_5, the actual effect is reflected on the coefficients of AN, AN*F_5 and COM. For 1/F and 2/F, the expectation effect is shown on the coefficients of AN and AN*F_5, the actual effect is reflected on the coefficients of AN, AN*F_5, COM and COM*F_2.

For simplicity and clearness, the percentage change in price is presented in Table 7.6.

Table 7.6: Percentage change in prices of different floor ranges

<table>
<thead>
<tr>
<th>Floor Range</th>
<th>After announcement Before Completion</th>
<th>After Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/F – 30/F</td>
<td>28.3%</td>
<td>7.3%</td>
</tr>
<tr>
<td>3/F – 5/F</td>
<td>25.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>1/F – 2/F</td>
<td>25.0%</td>
<td>-9.6%</td>
</tr>
</tbody>
</table>

For 6/F – 30/F, the office has no additional effect on those flats both after announcement and after completion. The dropping back of price after completion is mainly due to the over-expectation by people. Negative effects may also arouse, for example, the sky view is obstructed in the upper floors.

For 3/F – 5/F, the office has additional effect on those flats after announcement only, not after completion. It is because risk-averse buyers are more likely to over-estimate the negative effect on lower floors. It means that
people expect the office would have negative additional effects on those floors, but actually it does not have significant additional effects on those flats. Therefore, after completion, there are no additional effects on those floors.

For 1/F – 2/F, the office has additional effect on those flats both after announcement and after completion. Purchasers have considered the additional negative effect on these two floors, the coefficient of AN*F is –0.033119. However, in reality, the real additional effect is much more serious than expected. Buyers under-estimated the additional noise effect on these two floors. The coefficient of COM*F is –0.136457, resulting a negative percentage change in price after completion. The price of these flats surprisingly decreases by 9.6% after completion of the decentralised office. The actual impact on these two floors is negative. A reasonable explanation is that, the problem of noise and air pollution due to increased traffic becomes much more serious than before. Therefore, the negative externalities outweigh the positive externalities, resulting in a negative net effect.

Therefore, the results in equation 4 do not match the statement in hypothesis 2 that decentralised office has a less positive impact on lower floors in post-completion stage.
8.1 Summary of Findings

Hypothesis 1

The impact of office decentralisation is studied in terms of single effect of an additional decentralised office. First hypothesis is about the effect at different time.

From the statistical analysis on Equation 1, it shows that additional decentralised office building has a significant positive expectation effect on residential property in the post-announcement stage.

From the statistical analysis on Equation 2, it shows that the actual effect is much less than the expectation effect due to over-expectation, but the actual effect on residential property is still significantly positive in the post-completion stage.

Combination of both results supports hypothesis 1 that ‘Office decentralisation has positive impact on the neighbourhood residential
properties, in both the post-announcement stage and the post-completion stage. Hypothesis 1 is confirmed by the empirical results.

**Hypothesis 2**

After studying the general impact of the decentralised office, hypothesis 2 is to investigate the specific impact on lower floors in a vertical dimension, instead of studying the proximity effect in a horizontal dimension.

In Equation 3, the range of lower floors is determined by a trial and error basis. People expect an additional negative effect on the lower floors, which are found to be 6/F or below. The statistical analysis shows that, in the post-announcement stage, decentralised office building has a significantly less positive expectation effect on the lower floors of residential properties.

In equation 4, people expect an additional negative effect on 5/F or below, but the actual additional negative effect only occurs on 2/F and 1/F. However, the overall actual impact on 2/F and 1/F is found to be negative, which is an unexpected result. It concludes that, in the post-completion stage, the impact of decentralised office on lower floors is not only less negative, but sometimes negative.

Combination of both results only partially matches hypothesis 2. Office
decentralisation has a less positive impact on the lower floors of
neighbourhood residential properties only in the post-announcement stage,
but not in the post-completion stage. Hypothesis 2 cannot be confirmed.

**Explanation on unexpected result**

The negative impact on 1/F and 2/F flats after completion can be
explained by one main reason. Since COM is a time dummy for March 2008 –
December 2008, this is only a short period compared with 11 years. The
coefficient of COM is estimated by 171 out of 3837 transactions records only.
Among the 171 transactions, there are only 9 transactions for 1/F-2/F.
Therefore, the coefficient of COM*F^2 is estimated by only 9 transactions. Due
to this very small sample size for estimating effect of COM*F^2, the sampling
error is very large. Hence, bias may happen in the empirical results. If more
transactions records can be used to estimate the effect of COM and COM*F^2,
for instance data from March 2008 – December 2010; the results will be more
accurate and probably the impact on lower floors may not be negative.
8.2 Implications of Research

In the above summary, it implies that people have a high expectation on the effect of office decentralisation on the residential property market in Hong Kong. Over anticipation causes the property prices increase sharply and then drop back. Increase in accessibility to work may not actually benefit the residents. On the other hand, residents anticipate further commercial development near the decentralise office as a result of increase in land value in the district. Purchasers' expectation is so high that positive effects outweigh the negative effects like increased traffic congestion, air and noise pollution, and more people using the existing public facilities.

After a great fluctuation on price, the overall impact is positive in general. It implies that people neglect or under-estimate the negative effects during the expectation stage. In contrast, they only focus on the advantages of this issue and sometimes over-estimate the positive effects. When the office is completed and starts operation, the actual effect is reflected.

In a more specific way, after the announcement, risk-averse buyers may avoid buying lower floors as they expect these floor levels will suffer from more serious noise and air pollution due to increase in traffic volume. The lower
floors may include 1/F – 5/F or 6/F. Despite the problem of lower floors, the expectation effect is still very positive.

Then, after completion, the affected lower floors are found to be only 1/F and 2/F. In addition, it is out of expectation that the overall actual impact on these two floors turns out to be negative, due to the great negative effect of noise and air pollution. The impact of decentralised office on lower floors is not only less negative, but sometimes even negative.

All the above explanations help predicting the future residential property market trend when there are decentralised office developments nearby. It applies to many decentralised office regions outside CBD, like Quarry Bay, Kwun Tong, Kai Tak and Kowloon Bay, Kwai Chung, etc. A more specific forecast is that flats in higher floors benefit more from the trend of office decentralisation. Flats in lower floors benefit less or even suffer from this issue. The empirical results also help explaining the possible human behaviours related to office decentralisation.
8.3 Limitations of Research

First, using the two time dummies to test the expectation effect and actual effect has one drawback. The time dummy, AN, captures not only the expectation effect but also the effects of other information disclosed at the same time. Another dummy, COM, captures not only the additional effect but also the effects of other information disclosed at the same time. The unwanted information published at that two moments is also included in the effect. However, at that two moments, the announcement and completion of One Island East are the major issues affecting property prices, and there are no other special information published. Therefore, the empirical results still have its explanatory power.

Besides, the proximity effect of One Island East cannot be examined. It is because there are many other existing office towers nearby. Along the distance from One Island East, other existing office buildings and many other factors arouse, so it is difficult to consider all these factors into the hedonic price model. Instead, this research only considers the effect on the neighbourhood properties within 5-minute walking distance from One Island East.
8.4 Recommendations for Further Studies

There are other ways to study the impact of office decentralisation on residential properties. Here shows four suggestions of further studies.

Proximity effect

One of the major limitations in this research is that proximity effect is neglected. It can be overcome by studying the proximity effect of the first decentralised office development in Taikoo, instead of One Island East. The first decentralised office should have the most significant proximity effect on residential properties. At that time, there were no other office buildings which may affect the proximity effect.

However, if the first decentralised office in Taikoo is chosen, other limitations appear. The expectation effect cannot be estimated due to lack of data. In Quarry Bay and Taikoo, the first Grade A office building is established in 1991, but the EPRC database only includes transaction records starting from 27 April 1991. Expectation effect cannot be determined. Moreover, using time dummy to estimate actual effect does not give a precise result. It is because establishments of other nearby Grade A offices were closely
approaching. Actual effect was distorted by overlapping time periods with other office developments nearby.

First decentralised office in another district

Provided that there are sufficient transaction records, it is recommended to study the impact of the first decentralised office in another district. To study the impact of office decentralisation, the first decentralised office should have the most significant effect on the nearby properties. Suggested area of study is Kowloon Bay or Kwun Tong, but the potential problem is the insufficient transaction records of residential properties. Some of the old residential properties do not have active transactions and do not reflect market value.

Earlier decentralised office greater impact

Since One Island East is the 12th Grade A office building (as shown in Appendix 1) in Quarry Bay and Taikoo. It is questionable whether earlier decentralised office developments have a greater impact in terms of magnitude. It can be done by adding one time dummy for every office completion in the hedonic price model. Therefore, the coefficients of the time dummies can be compared. However, the assumption is no overlapping
periods of announcement and completion stages. This assumption is difficult to be achieved.

**Change of price gradient**

To study the overall impact of office decentralisation as a whole change in price gradients over a long period of time, say from 1991 to present, could be measured. This method can inspect the on-going change in price gradients during the whole process of office decentralisation. However, using the price gradient approach requires data from at least two districts. One district is the decentralised office node; another district should have totally no office developments or transportation improvement works during the whole period. This is to ensure that other things are kept constant, but this is hardly achievable because to find another district with no development for a very long time is not feasible in Hong Kong.

Although it is difficult to achieve, this is the ideal way to study the general impact of office decentralisation trend on residential properties in Hong Kong.
Appendix 1

Location and Completion year of Grade A offices in Quarry Bay and Taikoo

Figure 9.1: Location of Grade A offices in Quarry Bay and Taikoo

(Modified from source: Centamap http://www.centamap.com/gc/home.aspx)

Table 9.1: Completion year of Grade A offices in Quarry Bay and Taikoo

<table>
<thead>
<tr>
<th>No.</th>
<th>Grade A Office building</th>
<th>Completion Year</th>
<th>Developer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cityplaza Four</td>
<td>1991</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>2</td>
<td>Cityplaza Three</td>
<td>1992</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>3</td>
<td>Devon House</td>
<td>1993</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>4</td>
<td>PCCW Tower$^1$</td>
<td>1994</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>5</td>
<td>Dorset House</td>
<td>1994</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>6</td>
<td>Cityplaza One</td>
<td>1997</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>7</td>
<td>DCH Commercial Centre</td>
<td>1998</td>
<td>CITIC Pacific</td>
</tr>
<tr>
<td>8</td>
<td>Lincoln House</td>
<td>1998</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>9</td>
<td>Fortis Centre$^2$</td>
<td>1999</td>
<td>Hongkong Land</td>
</tr>
<tr>
<td>10</td>
<td>Oxford House</td>
<td>1999</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>11</td>
<td>Cambridge House</td>
<td>2003</td>
<td>Swire Properties</td>
</tr>
<tr>
<td>12</td>
<td>One Island East</td>
<td>2008</td>
<td>Swire Properties</td>
</tr>
</tbody>
</table>

$^1$ Formerly known as Hongkong Telecom Tower
$^2$ Formerly known as 1063 King’s Road
Appendix 2

Floor Plans of Taikoo Shing

The sampled buildings are categorized into 4 main groups, which are Harbour View Gardens, Kam Din Terrace, Horizon Gardens and On Shing Terrace. Building plans in the same group are very similar. So, there are 4 types of building plans.

Figure 9.2: Building Plan of Willow Mansion (in Harbour View Gardens)

(Source: Centamap http://www.centamap.com/gc/home.aspx)

[Retrieved: 02-03-2009 15:30]
Figure 9.3: Building Plan of Ming Kung Mansion (in Kam Din Terrace)

(Source: Centamap http://www.centamap.com/gc/home.aspx)

[Retrieved: 02-03-2009 15:35]
Figure 9.4: Building Plan of Hoi Tien Mansion (in Horizon Gardens)

(Source: Centamap http://www.centamap.com/gc/home.aspx)

[Retrieved: 02-03-2009 15:40]
Figure 9.5: Building Plan of Hing On Mansion (in On Shing Terrace)

(Source: Centamap http://www.centamap.com/gc/home.aspx)

[Retrieved: 02-03-2009 15:45]
Appendix 3

Event Timeline of One Island East

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Acquisition</td>
<td>1997-2003</td>
<td>The Sun (2003, June 11)</td>
</tr>
<tr>
<td>Demolition start</td>
<td>Jun 2003</td>
<td>Swire Pacific (2003, June 12)</td>
</tr>
<tr>
<td>Demolition end</td>
<td>Jun 2004</td>
<td>Swire Pacific (2003, June 12)</td>
</tr>
</tbody>
</table>

3 鰂魚涌獲批建 69 層地積比逾 27 倍 太古閣層面倍增不尋常
4 太古華蘭路建 69 層商廈
5 益新及萬邦工業大廈之重建項目
6 ibid
7 金門接太古 20 億工程

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Appendix 4

Photos of previous use of the site of One Island East
(two industrial buildings)

Figure 9.6: Melbourne Industrial Building

(Source: http://www.hk-place.com/vp.php?board=1&id=1941-2)

[Retrieved: 24-01-2009 19:00]
Figure 9.7: Aik San Industrial Building

(Source: http://www.hk-place.com/vp.php?board=1&id=1941-2)

[Retrieved: 24-01-2009 19:00]
Appendix 5

Photo of the vacant site after demolition of industrial buildings

Figure 9.8: Vacant site after demolition of industrial buildings

(Source: http://www.hk-place.com/vp.php?board=1&id=1941-2)

[Retrieved: 24-01-2009 19:00]
Appendix 6

Photos of One Island East (construction stage)

Figure 9.9: Construction stage of One Island East (in September 2006)

(Source: http://forum.skyscraperpage.com/showthread.php?t=116483)

[Retrieval Time: 21-03-2009 23:00]
Figure 9.10: Construction stage of One Island East (in August 2007)

(Source: http://upload.wikimedia.org/wikipedia/commons/d/d3/Progress1.jpg)

Appendix 7

Photos of One Island East (completed)

Figure 9.11: One Island East (completed)

(Source: Photos taken on the date of site inspection)
Appendix 8

Photos of Taikoo Shing

Figure 9.12: Harbour View Gardens in Taikoo Shing

(Source: Photos taken on the date of site inspection)
Figure 9.13: Kam Din Terrace in Taikoo Shing

(Source: Photos taken on the date of site inspection)
Figure 9.14: Horizon Gardens in Taikoo Shing

(Source: Photos taken on the date of site inspection)
References


References


Walker, R., & Green, M. (1990). Office decentralization in Hong Kong. Hong Kong: Jones Lang Wootton Research.


