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Student Visa Holders in Rental Market: A Study of Mainland Students Housing Choice and Their Impact on Hong Kong's Housing Market

外來學生與租房市場: 內地學生的住房選擇及其對香港房屋租賃市場影響的研究

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Abstract

In 2000s, Hong Kong government launched new policies to attract non-local students to study in Hong Kong. This study examines the effects of mainland students on the local housing market in Hong Kong. The findings show that students have different housing choices than other types of migrants and, as a group, exhibit strong patterns of clustered living. The study further finds the average annual rental price in Hong Kong to have increased around 10% more in neighborhoods with student clusters than in other comparable neighborhoods in recent years. Non-local students have also increased the district-wide rental price, particularly in summer.

摘要

自從 2000 年來,香港政府制定了很多吸引外地學生的政策. 本研究檢驗了大陸學生對於香港房屋租賃市場的影響. 研究發現大陸學生與其他移民在住房選擇方面有很大的不同。大陸學生更傾向於聚集在一起。跟附近沒有學生聚集的社區相比,學生聚集區平均租金在近些年上漲 10%。另外學生也影響了幾個地區以及整個香港的暑期房租水平。

Original Objectives

The final report includes six sections. Section 1 and 2 introduce the background of students' immigrants and Hong Kong's housing market. Section 3 describes the methods on data collection and summarizes what data has been collected. Section 4 and 5 demonstrate detailed methodologies to examine students' housing choice and their rental impact respectively. Section 6 summarizes findings of this study and gives policy recommendation.

The original objectives of this study include:

1. To study the student visa holders' housing choice patterns
2. To find out the causes of their housing choice
3. To develop economic models to explain their housing choice behavior
4. To quantify impacts of student renters to local rental market
5. To propose a housing policy based on the result of this study

The final reports have successfully addressed all the original objectives. Specifically, the objective 1 has been addressed in section 3. The objective 2 and 3 have been addressed in section 4. The section 5 responses the objective 4, and the section 6 gives policy recommendation which accomplishes the objective 5.

I. Introduction

The economics literature has extensively examined the effects of immigrants on the local labor and housing markets in host cities, with empirical work suggesting that immigrants have little or no effect on employment rates or the wages of natives with similar skills (Altonji and Card, 1991; Friedberg, 2001; Friedberg and Hunt, 1995; LaLonde and Topel 1991). Scholars have two potential explanations for the effect of immigrants being immediately arbitrated away. The first is the crowd-out effect, that is, natives migrate out to avoid massive immigrant influxes (Filer, 1992; Frey, 1995). The second is that immigrants tend to move to places that offer high productivity and wage levels.

However, immigrants have been shown to generate a sizable effect on local housing markets. Burnley, Murphy and Fagan (1997), for example, find that immigrants are strongly correlated with changes in local housing prices in Sydney, Australia. Ley and Tuchener (1999) report a similar result in their study of the immigrant effect on the housing market in Toronto and Vancouver, Canada. Saiz (2006) investigates the effect of immigration on rentals in U.S. cities, and finds that an immigration inflow equal to 1% of a city's population is associated with average rent and housing value increases of about 1%.

Immigrants in existing studies are largely restricted to those who permanently relocate to host cities for work opportunities or family reunion. Student immigrants constitute a very different group, and may behave differently from other types of immigrants for several reasons. First,

students compete with natives not for employment, but rather for low-income housing. Hence, student visa holders have little effect on the local labor market, but can exaggerate the trend toward increased rents. Second, because most students do not earn an income, their opportunity cost of commuting is relatively low. The classic urban economic model developed by Alonso (1964), Mills (1967) and Muth (1969), the AMM model, and the economic geography model (Krugman, 1991) suggest that the time cost of transportation is a crucial factor in the location choices of both people and firms. However, it is unlikely to be a factor in student housing choices. Third, students are extremely mobile, and their housing choices exhibit a strong seasonal effect. Finally, students tend to share housing with others to achieve affordability, and those in the same ethnic group tend to exhibit clustered living patterns. Despite these differences from other immigrant groups, however, the housing choices of non-native students and resulting influence on local housing prices have been largely neglected in the literature.

Since the late 2000s, many universities in the capitalized world, including those in the U.S., U.K., Canada, Australia and Hong Kong, have accepted a growing number of non-local students, particularly students from mainland China. A large number of these students favor such major gateway cities as New York, Los Angeles, London and Hong Kong, where the cost of living is high.[1] As the growth trend in foreign students is likely to continue for several years to come, these students' effects on local economies constitute an interesting and important policy issue. To date, few efforts have been made to document how an influx of non-local

1 In the U.S., the top 4 institutions in 2013 in terms of foreign student numbers were New York University, Columbia University, University of California, Los Angeles and the University of Southern California. Each of these universities accepted more than 10,000 foreign students in that year, and all four are located in expensive cities. For more statistics, please see the Institute of International Education, Open Doors Data, 2014.

students affects the local economy, the housing market in particular.

To illustrate the housing choices of non-local students in global cities and the effects on rents of their growing numbers, the study reported herein focused on mainland Chinese students in Hong Kong. Hong Kong is one of the most densely populated places in the world. As discussed in the next section, universities in Hong Kong have accepted large numbers of mainland students in recent years, many of whom have difficulty finding a suitable place to live near their university. They must also compete for affordable housing with local low-income residents. Therefore, understanding the housing choices of this group and the resulting effects on the local housing market is meaningful from the public policy perspective.

This study's empirical findings suggest that students' disposable income is uncorrelated with their commuting time. They display a lower income elasticity of housing demand than local residents and, as a group, exhibit clustered living patterns. The study adopted the difference-in-differences method to examine the relative changes in rental prices in areas with student clustering and in comparable neighborhoods. The results show that students exert a significant effect by pushing up rents, particularly in neighborhoods with student clustering.

The housing market in every city is distinct, but there are two major similarities between that of Hong Kong and those of the other global cities mentioned above. First, rents and other living expenses are high, and a massive inflow of immigrants may well serve to push up rents. Second, like other global cities, Hong Kong is popular with foreign students. Foreign students elsewhere

may display similar housing behavior to mainland students in Hong Kong, specifically self-identification and clustering, and thus the results reported in this paper are likely to be of interest beyond Hong Kong.

The remainder of the report is organized as follows. Section 2 describes the growth trend of mainland students in Hong Kong. Section 3 presents the study's data source and describes the housing choice patterns of mainland students. Section 4 provides empirical analysis of these students' housing demand, and Section 5 explores the resulting effect on the local housing market. Section 6 concludes the paper.

II. Growth trend of mainland students and the housing market in Hong Kong

Hong Kong has historically been an immigrant society. After the handover of sovereignty in 1997, the Hong Kong government enacted several policies designed to attract mainland professionals and students to Hong Kong for employment and study. As a result, Hong Kong has seen an influx of mainland students since 2000. Table 1 shows the number of student visas issued to mainland students and professionals in the past 10 years. It can be seen that the number of mainland students has increased rapidly since the late 2000s, whereas the number of mainland professionals has grown relatively slowly. In recent years, the number of mainland professionals moving to Hong Kong has been less than half the number of mainland students.

There are eight universities in Hong Kong. Given the limited housing capacity of these

universities, an increasing number of students have begun to live off campus.[2] As non-local students pay much higher tuition than native students, university departments have incentives to accept more non-local students given their current capacities.[3] The number of non-local students is thus likely to remain high for several years to come. Statistics from the Education Bureau of Hong Kong show mainland Chinese students to currently account for nearly 90% of the non-local students on self-financing programs.[4] Thus mainland students, rather than students from other countries, are more likely to generate impact on local rents.

Hong Kong has one of the most expensive and volatile housing markets in the world, given its geographic constraints and strict controls on the land supply, meaning that finding affordable accommodation is no easy task for most mainland students. In 2014, 7.26 million people lived in an area totaling 1,108 square kilometers. As nearly 80% of Hong Kong is mountainous, built-up areas account for only 24% of the total land area, and only 7% of that area is designated for residential purposes (Planning Department of Hong Kong, 2014). Hong Kong imposes severe land-use restrictions. Although many factors can influence housing prices, the literature presents evidence to show that both geographic constraints and land supply regulations can increase housing prices enormously (Glaeser and Gyourko, 2002; Glaeser, Gyourko, and Saks, 2005; Saiz, 2010). Currently, housing prices in Hong Kong are at a historic high.

[2] Non-local students enrolled in undergraduate and PHD programs can live on-campus dorm. However, students enrolled in self-financing programs has to live off-campus.

3 I interviewed several program leaders in different departments of the City University of Hong Kong and Hong Kong University. The general conclusion of these interviews was that if each graduate program accepts around 15 non-local students, the resulting tuition revenue will cover operating costs. Accepting more non-local students generates profits, profits that are largely kept at the department level.

4 This figure refers only to students on full-time self-financing programs, in which the ratio of mainland students to all non-local students in the years from 2010 to 2013 were 86.3%, 87.8%, 90.3% and 90.2%, respectively.

Hong Kong has the second-largest public housing sector in the capitalist world after Singapore. The Hong Kong government launched a public housing program in the 1950s to provide affordable housing to low-income citizens[5]. In 2013, over 2.1 million Hong Kong residents lived in public rental housing (Census and Statistics Department of Hong Kong, 2014). Consequently, housing units developed by the private sector account for just slightly more than 50% of the total housing stock in Hong Kong. As non-residents, mainland students do not qualify to live in public housing, rendering it difficult for them to secure affordable housing.

Not surprisingly, most mainland students share apartments to make rents more affordable. Although the number of mainland students is relatively small compared with the total Hong Kong population, their marginal effect on local rents is not negligible given the limited housing supply. The next section describes these students' housing choices and living conditions.

III. Research Methodology

This section introduces research methodology and data collection procedures and summarizes the housing choice patterns of mainland students. Because there are no official statistics documenting their housing choices, questionnaire surveys were conducted to mainland graduate students enrolled in one-year Master's programs in the fall of 2013 and 2014.

Hong Kong comprises three geographic regions: Hong Kong Island, Kowloon and the New

[5] Public rental housing estates are the most numerous type of public housing estates, and are rented at discounted rates to low-income residents. Low-income eligibility criteria for public rental housing vary between families, the elderly and individual applicants.

Territories.[6] Figure 1 illustrates the locations of the universities in these three regions. I chose students from four of Hong Kong's eight universities to complete the questionnaires, namely, the Chinese University of Hong Kong (CUHK), City University of Hong Kong (CityU), Hong Kong Polytechnic University (PolyU) and Hong Kong Baptist University (HKBU). These four universities were selected because they are connected by the East Rail Line, and the commuting time between any two of the universities is within 25 minutes,[7] making it possible to examine students' influence on the rental market at the regional level. In this paper, I define the four universities selected as "East Rail-connected Universities" (ERCU henceforth). In Figure 1, the ERCU are indicated by red stars. The four non-ERCU are marked by yellow stars. They are spatially dispersed, and not well connected with the ERCU. However, it is reasonable to assume that ERCU students are representative of their non-ERCU counterparts.[8]

When collecting mainland student housing data, I randomly chose Taught Postgraduate Programs in different departments in each ERCU constituent university, and contacted professors in each to seek their cooperation in distributing the questionnaires in class.[9] Most expressed support for the study and agreed to leave 10-15 minutes for mainland students filling out questionnaire survey during their lectures. They generally made an announcement about the purpose of this study and encouraged mainland students participating in the survey at the beginning of their classes. In the fall of 2013, over 800 questionnaires were distributed, and

[6] Hong Kong Island is home to the central business district (CBD), although Kowloon is a larger urban area, and the New Territories is a suburban area.
[7] The East Rail Line is operated by Hong Kong Metro Transit Railway (MTR) and connects the transportation hub of Hung Hom Station in Hong Kong with Lowu Station in Shenzhen in mainland China.
8 The tuition fees for similar programs in the eight universities are very close, and students choose a university primarily on the basis of reputation rather than the accessibility of the metro system. Thus, the assumption is reasonable.
[9] Self-financing students are all enrolled in Taught Postgraduate Programs.

near 500 valid samples were obtained. In the fall of 2014, over 2000 questionnaires were distributed, over 1500 of which were deemed valid after data-cleaning. Table 2 summarizes the statistics on the number of questionnaire distributed and samples obtained in each university. The questionnaires were anonymous to avoid selection bias. Thus, students' decision to fill out a questionnaire was independent of his or her housing choice. Accordingly, the sample is suitable for use in interpreting mainland students' housing choice patterns.

The questionnaires included two dozens of questions eliciting personal, housing and transportation information. As the data on students' housing and transportation are consistent in the 2013 and 2014 datasets, the 2014 survey results alone are discussed in this section due to that survey's larger sample size. The top factors influencing the responding students' housing choices were the accessibility of public transportation, commuting distance to university, affordable rent and living environment. Many of the female students were also concerned about safety. Table 3 presents the statistics on student housing and transportation in 2014. The students at all four universities were similar in age. Most had no personal savings, and were entirely supported by their parents. The average monthly living expenditure differed slightly by university, although housing consumption was very similar. The rental prices paid also differed slightly by university. Among the ERCU, PolyU is closest to and CUHK farthest from the central business district (CBD). Thus, the rents and other housing expenses paid by students at these two universities would naturally differ. Across the four ERCU, an average of 3.75 students per apartment unit was the norm. Individual housing consumption was calculated by the proportion of rent an individual student paid out of the total rent for a unit. For example, if a

student paid 40% of the rent, his or her housing consumption was deemed to account for 40% of the unit size. Using this method, the average housing consumption was found to be around 165.4 square feet. The average travel time from students' apartments to the university was around 28 minutes. Most students chose the MTR as their main travel mode.

According to Hong Kong government statistics, the average living area of Hong Kong residents is 162 square feet per capita, which is similar to that of mainland students. The 2014 monthly incomes of residents at the 10th, 25th and 50th percentiles were HK$8,000, HK$10,500 and HK$14,800 respectively,[10] whereas the average monthly budget of mainland students was slightly above HK$8,000. These figures indicate that most mainland students can be treated as urban low income population.

Hong Kong comprises 18 administrative districts. Figure 2 shows the student housing locations and MTR lines on a map of these districts. Stars of different colors indicate different universities. The housing locations of mainland students are plotted as dots matching these colors. The plot reveals three main findings. First, most students live near an MTR line. Second, ERCU students are scattered across several neighborhoods, and some may live with roommates from other universities. Third, mainland students tend to cluster in several districts. The heat map of the housing locations of mainland students shown in Figure 3 visualizes the patterns of such clustering.

[10] US$1 = HK$7.753.

These findings raise two questions. First, how do mainland students choose their housing? Does their housing demand differ from that of other groups living in Hong Kong? Second, given their clustered living pattern, do mainland students exert a significant effect on the housing market in clustered areas and the wider districts? The section IV will use econometric models and statistical analysis to estimate the housing demand of mainland students. Section V will apply classical difference-in-difference approach to estimate the impact of mainland students to local housing rents.

IV. Empirical analysis of student housing demand

Models of residential location choice generally follow two distinct theoretical lines: the urban spatial structure model and Tiebout model of community choice. The urban spatial structure model (also called the AMM model) examines the tradeoff between housing consumption and commuting to a predetermined CBD. In the Tiebout model, residents are concerned with local public goods, and choose communities based on their preferences (Tiebout, 1956; Epple, 1984, 1999). Many studies following the Tiebout framework show that local expenditure on public schools, government amenities and even the presence of public housing can affect housing markets and choices (Nechyba, 1999, 2003; Davidoff, 2005; Leung et al., 2012). More recent research on location choice suggests that combing the two modeling perspectives provides a more realistic portrait of urban locations (Hanushek and Yilmaz, 2007, 2013).

In conjunction with the two aforementioned theoretical lines, there are two popular empirical

approaches to examining housing choices. In the AMM framework, the locations of different income groups depend on the relationship between the income elasticity of commuting cost and that of housing demand. Thus, one popular approach is to estimate both elasticities to determine the aggregate housing demand. Another approach is use of a statistical discrete-choice model such as the conditional logit model developed by McFadden (1974). Discrete choice models are widely used in housing and neighborhood studies (McFadden, 1978; Quigley, 1985; Brock and Durlauf 2002), and are appropriate when the choice among alternatives is modeled as a function of the characteristics of those alternatives. Interpreting the coefficients is generally difficult because of the nonlinearity of the link function and the incorporation of a base reference group.

Model selection depends on the research objectives. As one objective of the study reported herein was to examine the aggregate housing demand of mainland students, I estimated the income elasticity of commuting time and housing demand. The literature in this area differs in many respects, not only in terms of the functional form and level of aggregation, but also in the status of tenure, treatment of price terms and methods of specifying income. However, many studies apply the log linear function by assuming that residents have the same elasticity of demand. Both Mayo (1981) and Goodman and Kawai (1986) discuss the log linear function form of estimating housing demand. In addition to its analytical convenience, the income elasticity of housing demand is linked to the AMM model.

The AMM model assumes that individuals travel to the CBD to earn income, an assumption

that does not hold for students. In this literature, researchers begin by considering the opportunity cost of a unit of time as forgone wages, which implies that the income elasticity of the time value should be 1 (Becker, 1965). That is unlikely to be the case for students. Researchers also estimate the elasticity of the time cost of commuting with respect to income. Empirical evidence shows this elasticity to be less than unity, although most studies have found it to be larger than 0.5 (Wardman, 2001; Fosgerau, 2005). Glaeser, Kahn and Rappaport (2008) use a value of 0.75 to estimate the bid-rent curve of the urban poor. For mainland students in Hong Kong, commuting time refers to the time they spend traveling from their apartments to their universities. Students' disposable income can be thought of as their monthly budget, which is determined by their parents and thus exogenous. I interviewed about two dozen mainland students, all of whom said they knew their monthly budget before looking for accommodation. Hence, the exogenous assumption is plausible.[11] The following regression estimates the elasticity of commuting time with respect to students' disposable income.

$$\log(\text{commute time}) = a + b*\log(\text{income}) + \text{other controls} + \varepsilon.$$

To better estimate the elasticity coefficient, 2011 Hong Kong census data were used to control for local fixed effects. There are 287 geographic tertiary planning units (TPUs) in Hong Kong. The 2011 census contains social and demographic statistics at the TPU level. The mainland students in this study's sample lived in 71 TPUs. It was thus possible to control the TPU-level

[11] A simple econometric trick can also be used to prove the exogeneity of students' disposable income. Wooldridge (2013) introduced two steps for testing the exogeneity of a single explanatory variable. First, estimate the reduced form for y2 (students' disposable income) by regressing it on all exogenous variables. Obtain the residuals, say u. Second, add u to the structural equation and test for the significance of u using an ordinary least squares (OLS) regression. If the coefficient on u is close to 0, it can be concluded that y2 is not endogenous. Following this procedure, I tested the exogeneity of students' disposable income, and found the coefficient on u to be 0, thus further supporting my conclusion that such income is an exogenous variable. For more details, please see Wooldridge (2013, p. 534).

fixed effect in the regression. In fact, TPUs can largely be considered as neighborhoods in this study, and neighborhoods instead of TPUs are used in the following sections.

Table 4 presents the regression results. The control variables include travel mode, commuting time to the CBD, university and the neighborhood fixed effect. The regression was run using two datasets. Column 1 shows the results for the 2013 dataset. The elasticity of commuting time with respect to income is 0.001 and insignificant. The R^2 value is 0.55. Column 2 shows the results of the same log-log regression using the 2014 dataset. Again, the elasticity result is close to 0 and insignificant. Although surprising, these data confirm that mainland students' disposable income is uncorrelated with their commuting time.

I then measured students' income elasticity of housing demand. The empirical literature has produced a range of estimates, depending on such factors as the degree of aggregation, functional form and specific definition of income used, with many studies concluding that such demand is inelastic (Henderson and Ioannides, 1986; Harmon, 1988; Hoyt and Rosenthal, 1990). The traditional log-linear housing demand equation is specified as follows.

$$\log(\text{housing}) = a + b^* \log(\text{income}) + c^* \log(\text{housing price}) + \text{controls} + \varepsilon$$

This equation can be used to estimate the income and price elasticities, b and c. The controls include demographic characteristics, dwelling characteristics and community characteristics, and ε is random error. The literature points out two problems of estimating elasticities with this equation. First, studies have observed that housing demand is more responsive to long-run

expected income than transitory income and that permanent income must be considered as an explanatory variable (Attfield, 1980). Several studies have demonstrated the elasticity of permanent income to be greater than that of transient income (Goldman and Kawai, 1981; Smith, Rosen, and Fallis, 1988). Second, housing demand and price in given locations are determined simultaneously, with only their product observable. Many studies have used the hedonic pricing model to estimate the price index (Goodman and Kawai, 1984; Ermisch, Finlay, and Gibb, 1996).

Students' permanent income was not a concern in the current study. The disposable income of most was provided by their parents. Accordingly, they did not have to borrow against their anticipated lifetime earnings to support their studies in Hong Kong, and their permanent income was fully uncertain during their study period. In the 2014 dataset, 32.7% of students said that they would prefer to work in Hong Kong after graduation, 3% that they planned to continue with their studies and pursue a Ph.D. in Hong Kong or a country other than China, 35.4% that they planned to return to mainland China and 28.9% that they had no plans for their future careers at the moment. If fact, even if the participating students had been certain of their future income and permanent income, they still faced borrowing constraints.[12] The transient income they received from their parents was thus sufficient to measure the income elasticity of student housing demand.

In identifying housing prices using the hedonic approach, most studies use housing data across

[12] Unlike the U.S. capital market, the student loan system is underdeveloped in mainland China. None of the students in the current dataset obtained loans to support their studies in Hong Kong.

metropolitan statistical areas (MSAs) to estimate the price index at the MSA level. When data include only one housing market, the housing price definition needs to change to allow exogenous variation (Zabel, 2004). However, price elasticity estimates are highly sensitive to model specification and the way in which prices are defined. No price index of housing in Hong Kong's sub-districts is available. Given these concerns, I used the instrumental variable (IV) approach rather than a hedonic model to separate housing price and demand in the log-log equation.

Table 5 reports the results of the housing demand regressions. The first column includes students' income but not the housing price. Omitting that price may have biased the coefficient in both directions. In column (1), I control for university, sex, dwelling characteristics and the neighborhood fixed effect. The coefficient of student income elasticity is 0.608 and statistically significant at the 1% level. The R^2 value is 0.43. In columns (2) to column (4), I use three IVs to estimate the housing price. The 2011 Hong Kong government census reports statistics on residential median incomes, the educational characteristics of residents and median rents at the estate level. These variables should be correlated with current housing prices, but not directly related to students' housing choices in 2014. I obtain a similar coefficient of the income elasticity of housing demand using the three IVs. The price elasticity of housing demand differs depending on the variable used, but my primary interest here is estimating income elasticity. The F statistics in the first stage of the three IV regressions are all higher than 40, indicating a strong correlation between the variables and housing price. The R^2 values are all around 0.48. These regressions show the income elasticity of housing demand for students in Hong Kong to

be around 0.6. Tse and Raftery (1999) find the income elasticity of renters in the Hong Kong housing market to be in the range of 0.8 to 0.89 for all income groups, higher than that of the mainland students considered in this paper.

In sum, the results presented in this section show mainland students to have different housing demand from other types of renters, confirming my earlier supposition that non-resident students exhibit different housing behavior from other types of migrants. These students' income elasticity of commuting time is 0 and insignificant, which is surprising although not completely unexpected. Finally, the income elasticity of housing demand for mainland students is lower than that of Hong Kong residents. An individual student is a price taker when he or she chooses housing. As a group, students affect the housing market in the areas in which they cluster. The next section estimates their effect on the wider local housing market.

V. Effect of mainland students on local rental market

In the 2014 dataset, the mainland ERCU students lived in 330 estates, 71 neighborhoods and 14 administrative districts. However, 55% of them lived in just six neighborhoods, with 46.6% living on the 10 major estates in those neighborhoods. Figure 4 plots the six popular neighborhoods, and shows that students tended to cluster in three areas, which is consistent with the pattern shown in the heat map of students' housing locations. Table 6 summarizes the number of neighborhoods and estates in each cluster area. Area 1 is located in the Kowloon City district, which is close to PolyU, Area 2 in the Shatin district, which is close to the other

three ERCU, Area 3 in the Northern district, which is far from the CBD. The 2013 dataset confirms these three cluster areas.

The 2014 dataset shows that 76% of students sign rental contracts in July and August. I use the average rental price in those two months to represent the summer housing price. Figure 5 illustrates the divergent trends of summer and non-summer housing prices in the three cluster areas, although the two prices were roughly equivalent before 2007. The summer price has exceeded the non-summer price since the late 2000s, and the difference between them has increased sharply in recent years. The growing divergence between summer and non-summer rental prices is consistent with the growth trend of mainland students. However, statistical analysis is required to quantify mainland students' influence on rents.

To estimate that influence, I acquired monthly average rental price data on the major housing estates and neighborhoods of Hong Kong from Centaline Property, Hong Kong's largest housing data vendor. The average rental prices of the major estates in the cluster neighborhoods were used to represent the overall price level in those neighborhoods. I considered only the rents in private rental units, not those in public housing estates. The dataset covers the 2000-2014 period.

The difference-in-differences method was applied to compare the evolution in rents in neighborhoods with student clusters with that in comparable neighborhoods. The basic equation is as follows.

$$R_{it} = a_i + bD_{\text{after}} + cD_{\text{cluster}} + dD_{\text{after}}D_{\text{cluster}} + \varepsilon_{it},$$

where R_{it} is the average rent (or log rent) in area i in period t; a_i is the local fixed effect; D_{after} is a dummy variable that takes a value of 1 in the treatment period and of 0 in the pre-treatment period; D_{cluster} is a dummy variable that takes a value of 1 if the area exhibits student clustering and of 0 otherwise; ε_{it} is an error term; and *d* is the coefficient of interest.

Saiz (2003) used this method to examine the change in rental prices in Miami and three comparison cities after the Mariel Boatlift. Unlike that study, there was no one time-exogenous shock from immigrant inflows to distinguish the pre-treatment and treatment periods in the current research, as mainland students have been migrating to Hong Kong for more than a decade. As shown in Figure 5, students' effect on rents was likely to be negligible in the early 2000s, becoming visible only in recent years. Given the existing two years' data, 2013-2014 was chosen as the treatment period.[13] 2000-2006 was chosen as the pre-treatment period. Although this selection seems rather arbitrary, the results change little if the pre-treatment period is adjusted slightly.[14]

It was not possible to find perfectly comparable neighborhoods for each cluster neighborhood. Rent levels from neighborhood to neighborhood are bound to differ depending on the amenities available and demographic and economic characteristics. In an ideal case, the cluster

[13] Although data on student housing before 2013 are unavailable, the spatial pattern of mainland students is very likely to be persistent because students are attracted to areas with a concentration of individuals of similar social status.

[14] I also calculate the results using other pre-treatment (i.e., pre-treatment period: 2000-2004, 2000-2005, 2000-2007, 2000-2008), but the results remain essentially unchanged.

neighborhoods would be similar to comparable neighborhoods in every respect other than the extent to which they attract mainland students. As each cluster neighborhood was located in an administrative district (i.e., Area 1 in Kowloon City, Area 2 in Shatin and Area 3 in the North district), I chose comparable neighborhoods by pooling the remaining neighborhoods in each district. This selection method is valid for two reasons. First, the data showed no student clustering in the comparable neighborhoods. Second, the treatment and control neighborhoods had the same unobservable local fixed effect and time effect because they were in the same administrative district. Any confounding factors can be considered randomly distributed in each such district, and can be differentiated out via the difference-in-differences method. As students may crowd out some low-income renters in the cluster neighborhoods, students' effect on neighborhood rents may be underestimated. The results show the lower bound of that effect. Figure 6 shows the annual price in the treatment and control neighborhoods from 2000 to 2014 across the three comparisons. The control neighborhoods seem to provide reasonable counterfactuals with regard to the previous trends in housing prices.

Panel A in Table 7 reports the rental prices for the three comparison groups during the two periods. For changes in rental prices, the logarithmic specification was used to approximate the percentage supplied to interpret the results as differential percentage changes. The result obtained using log rent is reported in Panel B. I first compare changes in the summer housing price in the treatment and control neighborhoods. Compared with the average summer price in the other neighborhoods in Kowloon City, that in Area 1 was 12.7% lower in the 2000-2006 period. However, in 2013-2014 it was 4.6% higher than the summer price in the comparable

neighborhoods, for a net increase of nearly 17%. Similar results were obtained for the other two comparisons: between the two periods, the average summer rental price in Areas 2 and 3 increased by 15% and 11%, respectively. All of the results are statistically significant. I also compared the average annual rental prices in the clustered and non-clustered neighborhoods in the two periods, finding that those in the former increased over time by around 10%, a statistically significant increase in all cases. It is unsurprising that the increases in annual rental prices would be lower than those in summer prices.

Beyond the effects of mainland students, there may be other factors that influenced rents in the three comparisons, as briefly discussed in the following paragraphs.

First, the allocations of primary and secondary school slots in Hong Kong have residence-based preference. Parents who move to a particular district to secure a good education for their offspring can influence rents. According to statistics from the Education Bureau of Hong Kong, total enrollment in primary and secondary schools declined sharply over the past decade, although enrollment in the top-ranking schools increased slightly.[15] The rent hikes in the cluster neighborhoods identified in this study are unlikely to be the result of the local school effect.[16]

Second, non-ERCU students are unlikely to cluster in the same three districts as ERCU students.

[15] These statistics show total enrollment in primary and secondary school to have declined from 942,522 in 2003 to 719,290 in 2013. Among private and international schools, enrollment has increased at an annual rate of less than 1% over the past decade. Detailed figure can be found at http://www.edb.gov.hk/en/about-edb/publications-stat/figures/index.html.

[16] The most desirable primary and secondary schools are located on Hong Kong Island and in Kowloon. Student clustering in Areas 2 and 3 would be little affected by local schools, as they are in the Shatin and North districts. Area 1 is located in Kowloon, but no substantial changes were seen in the number of top-ranking schools or average per-school enrollment over the past decade, thus rendering it unlikely that there was any school effect on local rental prices.

The average commuting time from home to university for the ERCU students in this study was less than 30 minutes. I calculated the commuting time from the non-ERCU to the three focal clusters on Google Maps. By MTR and bus, the shortest such commuting time is between 50 and 80 minutes.

Third, mainland professionals are unlikely to choose to live in student-clustered neighborhoods, as those neighborhoods are relatively far from the CBD. Moreover, the annual number of mainland professionals entering Hong Kong is less than half that of mainland students (Table 1). Mainland professionals are thus unlikely to have been the driving force behind the observed rent increases in the cluster neighborhoods.

Finally, there is no record of new facilities being constructed in the cluster neighborhoods, which may have attracted new renters, including mainland students, and driven up rental prices. Taking all of these factors into account, we can conclude that mainland students do generate a sizable effect on rents at the neighborhood level.

I also examined students' effect on the housing market at the wider district level. Given the large scale of Hong Kong's urban area, it was difficult to distinguish that effect from other confounding factors. However, the school calendar provides a natural experimental setting for examining students' influence on rents in the summer compared with other seasons.

The difference-in-differences method was applied again to examine the relative differences in

rental prices between the summer and other seasons. The assumption was that other confounding factors would be randomly distributed across the year, which seems reasonable. To ensure consistency with the previous analysis, 2000-2006 and 2013-2014 was used as the pre-treatment and treatment periods. I chose the three local districts (Kowloon City, Shatin and Northern) and the whole of Hong Kong to examine the student effect. Table 8 summarizes the changes in rents in log form.

The difference in average rental prices between the summer and other seasons of the year was indistinguishable in the pre-treatment period. However, in the 2013-2014 period, the summer price in each comparison was higher than the average price in non-summer months. The results displayed the expected signs in all comparisons. On average, the summer price in Kowloon City increased by 1.3% in the treatment period, although that result was not significant. The equivalent increases in the Shatin and Northern districts, however, stood at about 6-7%, statistically significant at the 5% level. In the Hong Kong housing market as a whole, the average summer rental price increased 2.2% more than did the average annual price, statistically significant at the 5% level. As the number of local students has declined significantly over the past decade, it seems that non-local students, mainland students in particular, have played a role in raising summer rents district-wide.

VI. Conclusions, Policy Implications and Recommendations

The housing demand and price effects of migrants are important public policy issues in many

countries. Student visa holders exhibit different characteristics than other migrants in terms of housing consumption. As universities worldwide have seen dramatic increases in foreign student numbers in recent years, examining foreign students' effects on the local economy and housing market is useful from the public policy perspective.

This paper examines mainland Chinese students' effect on the local Hong Kong housing market. Mainland students can largely be considered members of the urban poor. They tend to share accommodation with other students to minimize rental costs. Their opportunity cost of commuting is very low. I find the elasticity of commuting time with respect to income to be almost 0. Compared with residents, mainland students also have a lower income elasticity of housing demand. As a group, they exhibit strongly clustered living patterns. I estimate mainland students' effect on housing prices at both the neighborhood and wider district level. Using the difference-in-differences approach, the study reported herein found that mainland students have a significant effect on the local housing market by driving up rental prices.

The study's results have implications for the issue of housing affordability for low-income Hong Kong residents. The housing prices in the student-clustered areas were in fact lower than those in comparable neighborhoods in the early 2000s, which suggests that these areas were formerly affordable places for low-income residents to live. However, following the significant price hikes in these areas in recent years, which have served to decrease real wages, housing has become markedly less affordable for low-income residents.

During the survey, I find dozens of students live in the student apartments operated by private-sectors. Through couples of interviews to those students, it seems students are quite satisfied with the price and living conditions of those apartments. Most apartments are renovated based on previous obsolete industrial or other types of buildings. Government should encourage such renovation and development projects. It will not only provide students a comfortable places to live, but also won't generate impact on local rents.

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Table 1: Annual number of visas issued to mainland students and professionals in Hong Kong

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of Student Visa	3,256	4,112	5,013	6,290	7,435	8,650	10,129	12,913	16,401	19,067	19,606
Number of Working Visa	3 745	4 029	5 031	6 075	6 744	6 514	7 445	8 088	8 105	8 017	9,313

Source: immigration department of Hong Kong.

Table 2: Statistics on questionnaire surveys in the fall of 2013 and 2014

2013 Fall Survey	CUHK	CityU	PolyU	HKBU	Total
Number of Departments Involved	6	4	8	3	21
Number of Questionnaire Distributed	216	273	265	104	858
Number of Valid Samples Obtained	129	178	142	54	503
Response Rate	59.72%	65.20%	53.58%	51.92%	58.62%
2014 Fall Survey	**CUHK**	**CityU**	**PolyU**	**HKBU**	**Total**
Number of Departments Involved	26	14	17	11	68
Number of Questionnaire Distributed	876	622	510	462	2470
Number of Valid Samples Obtained	557	416	306	261	1540
Response Rate	63.58%	66.88%	60.00%	56.49%	62.35%

Notes: Overall, the survey starts in the middle of September and lasts for two months. Survey in each university takes around 2-3 weeks.

Table 3: Statistics on student housing and transportation in 2014

	BUHK	CityU	CUHK	PolyU	Total
Age	22.91	23.13	22.94	23.02	23.00
	(1.38)	(1.72)	(1.30)	(1.53)	(1.48)
Monthly Budget (HKD)	8389.27	7852.44	8211.05	8115.77	8125.39
	(2849.30)	(2988.49)	(3361.95)	(2309.78)	(2992.26)
Housing Expenses (HKD)	3992.20	4037.36	3986.44	4113.31	4026.45
	(1663.47)	(1956.32)	(1851.93)	(1243.67)	(1745.47)
Other Consumption (HKD)	4427.66	3844.19	4260.46	4029.35	4130.34
	(1835.62)	(1712.38)	(2166.28)	(1684.84)	(1913.76)
Living Area (Square Feet)	161.61	163.29	172.73	158.12	165.40
	(66.75)	(74.76)	(75.23)	(46.32)	(69.02)
Numbers per Unit	3.89	3.80	3.56	3.88	3.75
	(1.24)	(1.23)	(1.09)	(1.20)	(1.18)
Rents per Square Feet (HKD)	25.24	25.40	23.47	26.23	24.84
	(4.44)	(4.01)	(4.35)	(3.59)	(4.27)
Commuting Time to Schools(Minutes)	32.15	28.17	31.30	22.46	28.84
	(9.93)	(6.79)	(8.45)	(8.69)	(9.06)
Commuting Time to CBD (Minutes)	39.20	41.20	55.19	31.63	44.02
	(10.07)	(11.31)	(12.15)	(8.80)	(14.21)
Transportation Split:					
Metro:	74.71%	94.23%	81.87%	30.07%	73.70%
Bus:	10.34%	2.64%	15.98%	2.94%	8.83%
Walking:	14.94%	3.13%	2.15%	66.99%	17.47%
Observations	258	416	557	306	1540

Notes: The table presents basic statistics on the participating students' housing and transportation. Commuting time to the CBD is calculated using Google Maps. The numbers in parentheses are standard errors.

Table 4: Elasticity of commuting time with respect to income

	Log of commuting time	
	OLS-2013 (1)	OLS-2014 (2)
Log of student income	0.001 (0.05)	-0.049 (0.03)
Constant	3.468 (0.65)	3.822 (0.275)
Adjusted R-squared	0.55	0.39
Observations	500	1540
Other Controlled Variables		
Travel Model	Yes	Yes
Distance to CBD	Yes	Yes
School	Yes	Yes
Neighborhood fixed effect	Yes	Yes

Notes: I use students' monthly budget as their income in the regression. The numbers in parentheses are standard errors.

Table 5: Income elasticity of housing demand for mainland students

	Log (housing size)			
	OLS (1)	IV(2)	IV (3)	IV(4)
Log (student income)	0.608***(0.033)	0.594***（0.035）	0.604***（0.034）	0.596***(0.039)
Log (rent)		-0.611**（0.150）	-0.724***（0.089）	-0.46*(0.296)
Instruments from 2011 census		median income	education level	median rents
F statistic		45.56	53.09	41.10
Adjusted R-squared	0.43	0.48	0.48	0.47
Other Controlled Variables				
University	Yes	Yes	Yes	Yes
Gender	Yes	Yes	Yes	Yes
Age of unit	Yes	Yes	Yes	Yes
Numbers of rooms	Yes	Yes	Yes	Yes
Distance to CBD	Yes	Yes	Yes	Yes
Neighborhood fixed effect	Yes	Yes	Yes	Yes

Notes: I use students' monthly budget as their income in the regression. The numbers in parentheses are standard errors.

Table 6: Student components of each cluster area

	Area 1	Area 2	Area 3	Total
Administrative districts	Kowloon City	Shatin	North	
Commuting time to CBD (minutes)	27	50	64	
Number of neighborhoods	2	3	1	6
Number of major estates	2	6	2	10
Ratio of students	15.10%	34.15%	5.80%	55.10%

Notes: There is no uniform definition for clustering. I calculate the ratio of mainland students in each neighborhood to all students in the sample. If the ratio is higher than 5%, I define the neighborhood as a cluster area.

Table 7 Panel A: Rents in student-clustered areas and comparable areas

	Summer rental price		Annual rental price	
	2000-2006	2013-2014	2000-2006	2013-2014
Clustering Area 1	16.026 (0.717)	28.681(1.093)	16.279(0.619)	27.473(1.028)
The rest of neighborhoods in Kowloon City	18.144(0.627)	27.38 (1.09)	18.036(0.516)	27.345(0.635)
Clustering Area 2	12.469(0.504)	26.695(1.035)	12.447(0.452)	24.905(0.815)
The rest of neighborhoods in Shatin district	12.665(0.581)	23.343(0.753)	12.574(0.549)	22.839(0.527)
Clustering Area 3	9.078(0.338)	19.445(0.95)	8.956(0.302)	17.984(0.532)
The rest of neighborhoods in North district	9.154(0.361)	17.547(0.614)	9.258(0.312)	16.998(0.418)

Table 7 Panel B: Average log rents in student-clustered areas and comparable areas

	Summer rental price			Annual rental price		
	2000-2006	2013-2014	Changes	2000-2006	2013-2014	Changes
Clustering Area 1	2.768（0.046）	3.355（0.038）	0.588***(0.092)	2.785（0.038）	3.312（0.037）	0.527***(0.077)
The rest of neighborhoods in Kowloon City	2.895（0.036）	3.309（0.040）	0.414***(0.072)	2.89（0.029）	3.308（0.023）	0.418***(0.059)
Difference	-0.127***(0.015)	0.046(0.002)	**0.173***(0.029)**	-0.104**(0.016)	0.004(0.014)	**0.109**(0.032)**
Clustering Area 2	2.518（0.041）	3.284（0.039）	0.765***(0.082)	2.518（0.036）	3.215（0.033）	0.697***(0.073)
The rest of neighborhoods in Shatin district	2.532（0.047）	3.150（0.032）	0.617***(0.094)	2.526（0.044）	3.128（0.023）	0.602***(0.088)
Difference	-0.014(0.012)	0.134***(0.007)	**0.148***(0.025)**	-0.008(0.010)	0.086***(0.010)	**0.095***(0.019)**
Clustering Area 3	2.202（0.038）	2.966 （0.049）	0.765***(0.078)	2.189（0.034）	2.889（0.030）	0.700***(0.067)
The rest of neighborhoods in North district	2.209（0.040）	2.864（0.035）	0.655***(0.079)	2.222（0.034）	2.833（0.025）	0.611***(0.067)
Difference	-0.008(0.010)	0.102***(0.014)	**0.110***(0.021)**	-0.033**(0.008)	0.056***(0.005)	**0.089***(0.015)**

Notes: The other neighborhoods in each administrative district were selected as comparable neighborhoods for the student-clustered areas. The numbers in parentheses are standard errors.

Table 8: Differences in log rents between the summer and other seasons of the year in selected districts and Hong Kong

		2000-2006	2012-2014	Changes
Kowloon City District	Rental price in summer	2.868 (0.038)	3.319 (0.040)	0.451***(0.076)
	Rental price in other months	2.867(0.030)	3.305(0.024)	0.438***(0.060)
	Difference	0.001(0.014)	0.014(0.016)	**0.013(0.029)**
Shatin District	Rental price in summer	2.517(0.043)	3.218(0.034)	0.701***(0.085)
	Rental price in other months	2.516(0.042)	3.159(0.024)	0.643***(0.083)
	Difference	0.001(0.011)	0.059***(0.011)	**0.058**(0.021)**
North District	Rental price in summer	2.208(0.039)	2.896(0.039)	0.688***(0.078)
	Rental price in other months	2.214(0.033)	2.836(0.025)	0.622***(0.065)
	Difference	-0.007(0.010)	0.060**(0.014)	**0.067**(0.021)**
Hong Kong Whole City	Rental price in summer	2.646(0.036)	3.236(0.030)	0.590***(0.072)
	Rental price in other months	2.645(0.034)	3.212(0.017)	0.568***(0.067)
	Difference	0.001(0.004)	0.024(0.013)	**0.022**(0.009)**

Note: The numbers in parentheses are standard errors

Figure 1: Locations of universities in Hong Kong

Figure 2: Housing locations of mainland students in Hong Kong

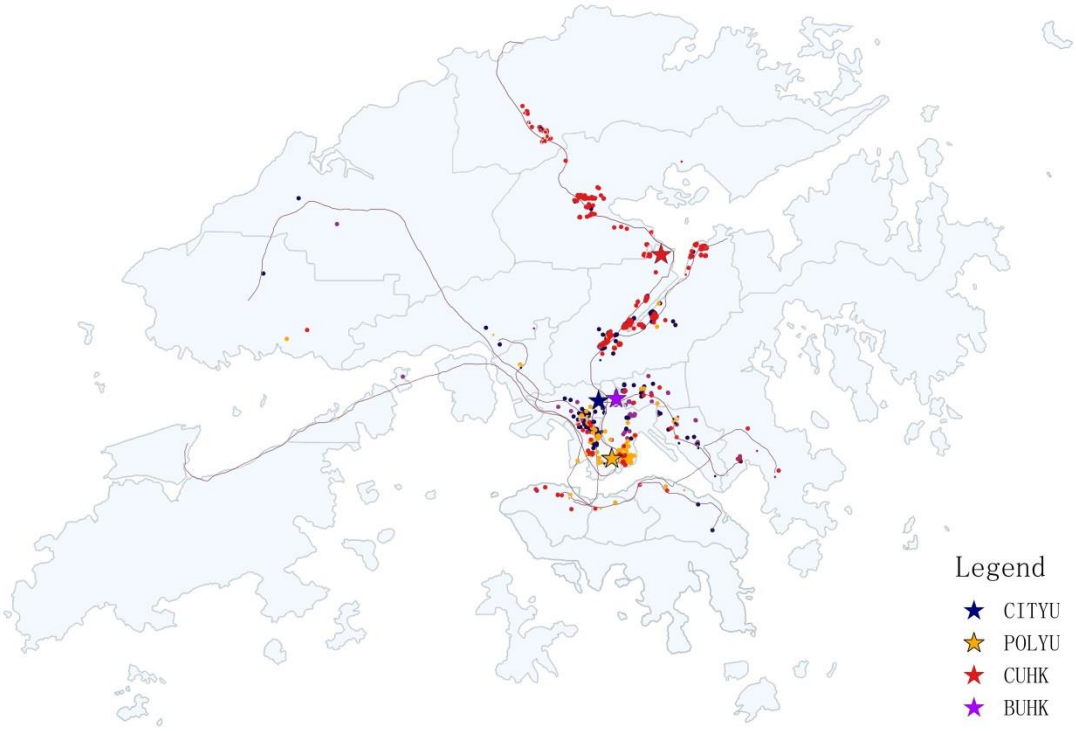
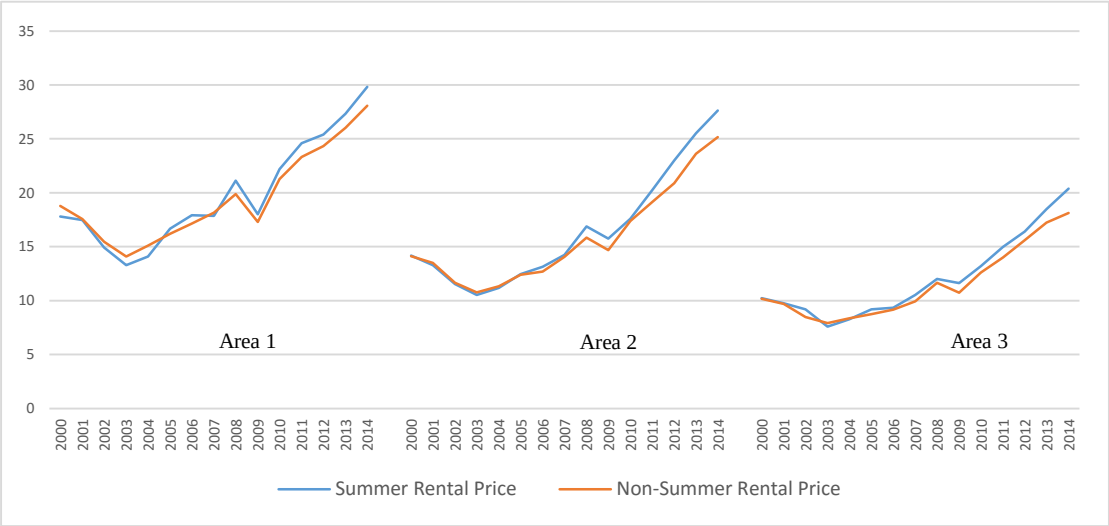


Figure 3: Heat map of housing locations for mainland students

Figure 4: Areas with students clustering and their corresponding districts

Figure 5: Summer rental price VS non-summer rental price in clustering areas since 2000 (HKD/square feet)



Notes: The summer rental price is the average summer price in July and August. The non-summer rental price is the average the rest 10 monthly rental prices.

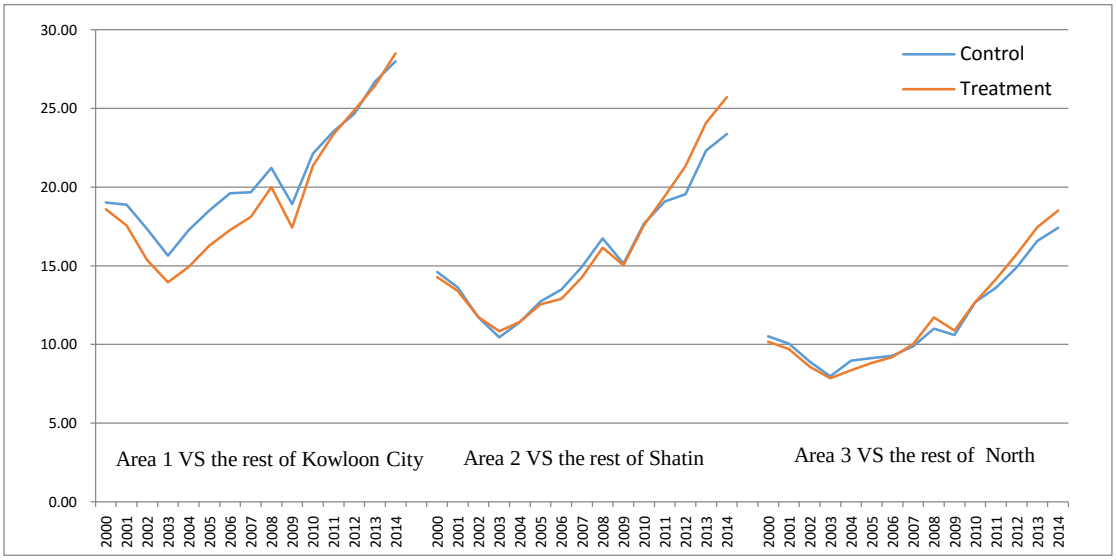



Figure 6: Annual rental prices among three comparison since 2000 (HKD/square feet)