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# **Non-local Students, Housing Demand and Rental Impact: Evidence from Mainland Students in Hong Kong**

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Since the late 2000s, many universities worldwide have seen a significant increase in the number of non-local students. This study examines the aggregate housing demand of those students and their impact on local rentals by using mainland students in Hong Kong as an example. The findings show that students have very different residential patterns and housing demand than other types of residents. Their income elasticity of commuting is close to 0, and they have lower income elasticity of housing demand compared with the local residents. As a group, they exhibit strong patterns of clustered living situations. By applying the differences-in-differences approach, the study finds that the average annual rental price has increased over 10% in neighborhoods with student clusters than in other comparable neighborhoods in recent years.

### **Keywords**

Students, Housing Demand, Rental Impact, Clustered living, Hong Kong

## 1. Introduction

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 major gateway cities such as New York, Los Angeles, London and Hong Kong, where the cost of living is high.<sup>1</sup> As the trend of growth of foreign students is likely to continue for several years to come, their effects on the local economies constitute an interesting and important policy issue. To date, few efforts have been made to document how an influx of non-local students affects the local economy, and in particular, the housing market.

Existing studies have shown that immigrants can 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 Tucherer (1999) report a similar result in their study of the immigrant effect on the housing market in the cities of Toronto and Vancouver in Canada. Saiz (2007) investigates the effect of immigration on rentals in U.S. cities, and finds that an immigration inflow equal to 1% of the population of a city is associated with average rent and housing value increases of about 1%.

Immigrants in these studies are largely restricted to those who permanently relocate to host cities for work opportunities or family reunion. Non-local students constitute a very different group, and may behave differently from other types of immigrants for several reasons. First, these students do not earn an income, and their opportunity cost of commuting tends to be low. Second, these students are extremely mobile, and their housing choices exhibit a strong seasonal effect. Lastly, they tend to share housing with others for affordability, and those in the same ethnic group tend to exhibit clustered living patterns. Despite these differences from other immigrant groups, the housing choices of non-local students and resulting influence on local housing markets have been largely neglected in the literature.

To illustrate the housing demand of non-local students and the effects on local housing markets, the study reported herein focuses 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

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<sup>1</sup> 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 Institute of International Education (2014).

also compete for affordable housing with low-income local residents. Therefore, understanding the housing choices of this group and the resulting effects on the local housing market is meaningful from a public policy perspective.

The findings of this study suggest that student income is uncorrelated with their commuting time. They display a lower income elasticity of housing demand than local residents. As a group, they exhibit clustered living patterns and exert a significant effect by pushing up rent, particularly in neighborhoods with student clustering.

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

## **2. Growth Trend of Mainland Students and the Housing Market in Hong Kong**

Hong Kong has been historically an immigrant society. After the handover of sovereignty back to mainland China 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.

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. As non-local students pay much higher tuition than local students, university departments have incentive to accept more non-local students given their current capacities. 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 that mainland Chinese students currently account for nearly 90% of the non-local students in self-financing programs.<sup>2</sup>

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<sup>2</sup> This figure refers only to students in full-time self-financing programs, in which the ratio of mainland students to all non-local students from 2010 to 2013 was 86.3%, 87.8%, 90.3% and 90.2%, respectively.

**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 Visas	3,256	4,112	5,013	6,290	7,435	8,650	10,129	12,913	16,401	19,067	19,606
Number of Work Visas	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, the Government of the Hong Kong SAR (2015)

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 2015, 7.26 million people lived in an area that totaled 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, 2015). Hong Kong imposes severe land-use restrictions. Analyses of government land disposal suggest that non-market forces strongly influence the land supply (Leung, 1986; Wong, 2015). Although many factors can influence housing prices, the literature presents evidence to show that both geographic constraints and land supply regulations can enormously increase housing prices (Glaeser and Gyourko, 2002; Glaeser, Gyourko, and Saks, 2005; Saiz, 2010). Currently, housing prices in Hong Kong are at a historic high.

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. In 2014, over 2.1 million Hong Kong residents lived in public rental housing (Census and Statistics Department of Hong Kong, 2015). 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 renting more affordable. Although the number of mainland students is relatively small compared with the total Hong Kong population, their marginal effect on local rent is not negligible given the limited housing supply. The next section describes the housing choices and living conditions of these students.

### **3. Data and Descriptive Statistics**

Hong Kong comprises three geographic regions: Hong Kong Island, Kowloon and the New Territories.<sup>3</sup> Figure 1 illustrates the locations of the universities in these three regions. We chose students from four of the eight universities in Hong Kong to complete 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

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<sup>3</sup> Hong Kong Island is home to the central business district (CBD), while Kowloon is a larger urban area, and the New Territories is a suburban area.

25 minutes,<sup>4</sup> making it possible to examine the influence of students on the rental market at the regional level. In this paper, we define the selected four universities as “East Rail-connected Universities” (ERCUs henceforth). In Figure 1, the ERCUs are indicated as red stars. The four non-ERCUs are marked with yellow stars. They are spatially dispersed, and not well connected with the ERCUs. However, it is reasonable to assume that ERUCU students are representative of their non-ERUCU counterparts.<sup>5</sup>

**Figure 1** Location of Universities in Hong Kong



Since there are no official statistics that document their housing choices, we administered questionnaire surveys to mainland graduate students enrolled in self-financing programs in the fall of 2013 and 2014. When collecting their housing data, we chose around 10 departments in the constituent university of each ERUCU, and contacted professors in each to seek their cooperation in distributing the questionnaires in class. Most expressed support for the study and agreed to assist with the in-class survey. In the fall of 2013, over 800 questionnaires were distributed, and nearly 600 were collected, for a valid sample of 500 after cleaning the data. In the fall of 2014, over 2000 questionnaires were distributed, with nearly 1900 returned, 1500 of which were

<sup>4</sup> 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.

<sup>5</sup> 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.

deemed valid after data-cleaning. The questionnaires were anonymous to avoid selection bias. Thus, the decision of students to fill out a questionnaire was independent of his or her housing choice. Accordingly, we believe that the sample is suitable for use in interpreting the housing choice patterns of mainland students.

The questionnaires included over two dozen questions that elicited personal, housing and transportation information. As the housing and transportation data are consistent in the 2013 and 2014 datasets, the 2014 survey results alone are discussed in this section due to the larger sample size. The top factors that influence the housing choices of the respondent students are the accessibility of public transportation, commuting distance to university, affordable rent and living environment. Many of the female students are also concerned about safety. Table 2 presents the statistics on student housing and transportation in 2014. The students at all four universities are similar in age. Most have no personal savings, and are entirely supported by their parents. The average monthly living expenditure differs slightly by university, although housing consumption is very similar. The rent paid also differs slightly by university. Among the ERCUs, PolyU is closest in proximity to the central business district (CBD) while the CUHK is the farthest away. Thus, the rent and other housing expenses paid by students at these two universities would naturally differ. Across the four ERCUs, an average of 3.75 students per apartment unit is the norm. Individual housing demand is 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 demand was deemed to account for 40% of the unit size. Using this method, the average housing demand was found to be around 165.4 square feet. The average travel time from an apartment to the university is around 28 minutes. Most students choose the MTR as their main mode of travel.

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 the mainland students. The 2014 monthly income of residents at the 10th, 25th and 50th percentiles was HK\$8,000, HK\$10,500 and HK\$14,800 respectively,<sup>6</sup> whereas the average monthly budget of the mainland students was slightly above HK\$8,000. These figures indicate that mainland students compete primarily with low-income locals for housing and other types of consumption.

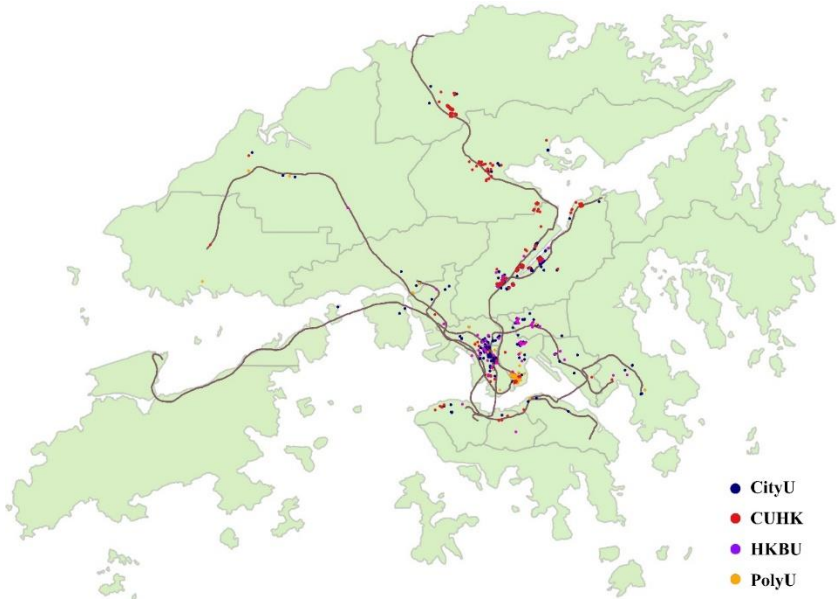
Hong Kong comprises 18 administrative districts. Figure 2 shows the student housing locations and MTR lines on a map of these districts. The housing locations of mainland students are plotted as dots, in which different color dots indicate students in different universities. The plot reveals three main 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

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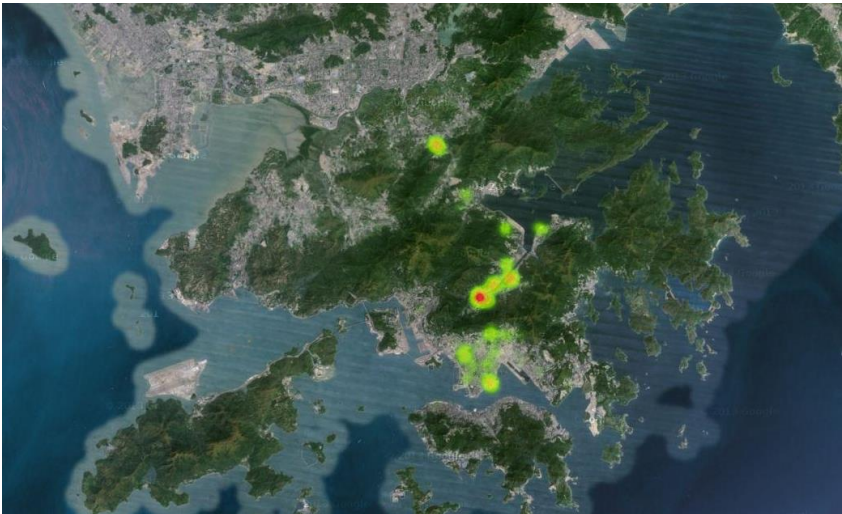
<sup>6</sup> US\$1 = HK\$7.753.

districts. The heat map of the housing locations of the mainland students shown in Figure 3 visualizes the patterns of such clustering.

**Figure 2 Housing Locations of Mainland Students in Hong Kong**



**Figure 3 Heat Map of Housing Locations of Mainland Students**





**Table 2** Statistics on Student Housing and Transportation in 2014

	BUHK	CityU	CUHK	PolyU	Total
Age	22.91 (1.38)	23.13 (1.72)	22.94 (1.30)	23.02 (1.53)	23.00 (1.48)
Monthly Income (HKD)	8389.27 (2849.30)	7852.44 (2988.49)	8211.05 (3361.95)	8115.77 (2309.78)	8125.39 (2992.26)
Housing Expenses (HKD)	3992.20 (1663.47)	4037.36 (1956.32)	3986.44 (1851.93)	4113.31 (1243.67)	4026.45 (1745.47)
Other types of Consumption (HKD)	4427.66 (1835.62)	3844.19 (1712.38)	4260.46 (2166.28)	4029.35 (1684.84)	4130.34 (1913.76)
Living Area (Square Feet)	161.61 (66.75)	163.29 (74.76)	172.73 (75.23)	158.12 (46.32)	165.40 (69.02)
Number per Unit	3.89 (1.24)	3.80 (1.23)	3.56 (1.09)	3.88 (1.20)	3.75 (1.18)
Rent per Square Feet (HKD)	25.24 (4.44)	25.40 (4.01)	23.47 (4.35)	26.23 (3.59)	24.84 (4.27)
Commuting Time to School (Minutes)	32.15 (9.93)	28.17 (6.79)	31.30 (8.45)	22.46 (8.69)	28.84 (9.06)
Commuting Time to CBD (Minutes)	39.20 (10.07)	41.20 (11.31)	55.19 (12.15)	31.63 (8.80)	44.02 (14.21)
<b>Transportation Split:</b>					
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	261	416	557	306	1540

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

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 two following sections address these questions in turn.

#### 4. Empirical Analysis of Student Housing Demand

The urban spatial structure model developed by Alonso (1964), Mills (1967) and Muth (1969) (also called the AMM model) examines the tradeoff between housing consumption and commuting to a predetermined CBD. 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. The empirical 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.

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). 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 students, commuting time refers to the time that they spend traveling from their apartment to their university. Over 95% of the students are supported by their parents, and the survey shows that they have a pre-determined monthly income for living in Hong Kong. Hence, the income is exogenous. Equation 1 estimates the elasticity of commuting time with respect to the income of the students.

$$\log(\text{commute time}) = a + b \cdot \log(\text{income}) + \text{other controls} + \varepsilon \quad (1)$$

To better estimate the elasticity coefficient, we used 2011 Hong Kong census data 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 the sample of this study lived in 71 TPUs. It was thus possible to control the TPU-level 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 3 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 by 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 with the 2014 dataset. Again, the elasticity result is close to 0 and insignificant. Although surprising, these data confirm that the disposable income of mainland students is uncorrelated with their commuting time.

**Table 3 Elasticity of Commuting Time with Respect to Income**

	Log of commuting time	
	OLS-2013 (1)	OLS-2014 (2)
<b>Log of student income</b>	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
<b>Other Controlled Variables</b>		
Travel Mode	Yes	Yes
Distance to CBD	Yes	Yes
School	Yes	Yes
Neighborhood fixed effect	Yes	Yes

*Notes:* The numbers in parentheses are standard errors.

We then measured the income elasticity of housing demand of the students. The empirical literature has produced a range of estimates, depending on factors such 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.

$$\log(\text{housing}) = a + b \cdot \log(\text{income}) + c \cdot \log(\text{housing price}) + \text{controls} + \varepsilon \quad (2)$$

Equation 2 can be used to estimate the income and price elasticities,  $b$  and  $c$ . The controls include demographic, dwelling and community characteristics, and  $\varepsilon$  is a 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 (Goodman 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).

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

In identifying housing prices with a hedonic approach, most studies use housing data across metropolitan statistical areas (MSAs) to estimate the price index at the MSA level. When the 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 the sub-districts of Hong Kong is available. Given these concerns, we used the instrumental variable (IV) approach rather than a hedonic model to separate housing price and demand in the log-log equation.

Table 4 reports the results of the housing demand regressions. The first column includes the income of students but not the housing price. Omitting that price may have biased the coefficient in both directions. In Column (1), we control for university, gender, 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 (4), we 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 the housing choices of students in 2014. We obtained a similar coefficient of the income elasticity of housing demand by using the three IVs. The price elasticity of housing demand differs depending on the variable used, but our primary interest here is estimating income elasticity. The F statistics in the first stage of the three IV regressions are all higher than 40, thus 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, which is significantly higher than that of the mainland students considered in this paper.

**Table 4** Income Elasticity of Housing Demand of Mainland Students

	Log (housing size)			
	OLS (1)	IV (2)	IV (3)	IV (4)
<b>Log (student income)</b>	0.608*** (0.033)	0.594*** (0.035)	0.604*** (0.034)	0.596*** (0.039)
<b>Log (rent)</b>		-0.611** (0.150)	-0.724*** (0.089)	-0.46* (0.296)
Instruments from 2011 census		median income	education level	median rent
F statistic		45.56	53.09	41.1
Adjusted R-squared	0.43	0.48	0.48	0.47
<b>Other Controlled Variables</b>				
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:* The numbers in parentheses are standard errors.

In sum, the results presented in this section show mainland students to have different housing patterns and demand from other types of renters, thus confirming our earlier supposition that non-resident students may exhibit different housing behavior. 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.

## 5. 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 in the 10 major estates in those neighborhoods. Figure 4 plots the six popular neighborhoods, and shows that students tend to cluster in three areas, which is consistent with the pattern shown in the heat map of the housing locations of the students. Table 5 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 ERCUs; and Area 3 is in the North

District, which is far from the CBD. The 2013 dataset confirms these three cluster areas.

**Figure 4** Areas with Student Clustering and Their Corresponding Districts



**Table 5** Student Make-up of Each Cluster Area

	Area 1	Area 2	Area 3	Total
Administrative district	Kowloon City	Shatin	North District	
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. We calculate the ratio of mainland students in each neighborhood to all students in the sample. If the ratio is higher than 5%, we define the neighborhood as a cluster area.

The 2014 dataset shows that 76% of the students sign rental contracts in July and August. The average rental price in those two months are used 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, a statistical analysis is required to quantify their influence on rent.

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

The empirical strategy used to estimate the rental impact of these students on neighborhoods with student clustering is the difference-in-difference (DID) method.<sup>7</sup> DID became a popular method since the work by Ashenfelter and Card (1985). The setup is that we observe outcomes for two groups for two time periods. Both groups are similar in many aspects originally in the first period, while one group is exposed to a treatment in the second period, and another group (control) is not. We can observe the same units within a group in both periods. The effect of the treatment can be estimated by comparing to the average change over time in the outcome for both the treatment and control groups. DID can remove the effects of extraneous factors and selection bias.

In this paper, neighborhoods with student clustering can be considered to be treatment districts. Neighborhoods nearby without student clustering are the control districts. The treatment is due to massive student immigrants and their clustered living. Saiz (2003) used this method to examine the change in rental prices in Miami and three comparison cities after the Mariel boatlift (mass emigration of Cubans). Unlike that study, there was no one time-exogenous shock from immigrant inflow to differentiate between 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, the effect of these students on rent is likely to be negligible in the early 2000s, and becoming visible only in recent years. Therefore, we chose 2000-2006 as the

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<sup>7</sup> Several studies apply the IV approach to estimate the impact of immigrants on the local housing market. For example, Saiz (2007) constructs a “shift-share” of the national levels of immigration into different areas. The ‘shift share’ applies the early ratio of the number of immigrants to the number of local residents to predict future spatial distribution of immigrants across cities or neighborhoods within a city. In this study, we only have two years of data for the sample, and do not have the annual number of local residents at the neighborhood level. Given the data limitations, we cannot apply the IV approach to address the endogeneity of the choice of location of the students. Instead, we apply the DID approach. We believe that the DID approach also applies well to the setting.

pre-treatment period, since the number of mainland students in that period is very low. As our data only reveal the living patterns of mainland students in 2013 and 2014, we chose 2013-2014 as the treatment period.<sup>8</sup> Although the two selected time periods seem rather arbitrary, the results change minimally if the pre-treatment period is adjusted slightly.<sup>9</sup> We believe that the DID can largely eliminate biases and reveal a reliable result. The basic equation is as follows.

$$R_{it} = a_i + bD_{\text{after}} + cD_{\text{cluster}} + dD_{\text{after}}D_{\text{cluster}} + \varepsilon_{it} \quad (3)$$

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

It was not possible to find perfectly comparable neighborhoods for each cluster neighborhood. Rent levels are bound to differ from neighborhood to neighborhood depending on the amenities available and demographic and economic characteristics. In an ideal case, the cluster neighborhoods would be similar to comparable neighborhoods in every respect other than the extent to which they attract mainland students. As each cluster neighborhood is located in an administrative district (i.e., Area 1 in Kowloon City, Area 2 in Shatin and Area 3 in the North District), we chose comparable neighborhoods by pooling the remaining neighborhoods in each district. This selection method is valid for two reasons. First, the data show no student clustering in the comparable neighborhoods. Second, the treatment and control neighborhoods have the same unobservable local fixed and time effects because they are in the same administrative district. Any confounding factors can be considered randomly distributed in each such district, and can be differentiated out via the DID method. As students may crowd out some low-income renters in the cluster neighborhoods, their effect on neighborhood rent 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.

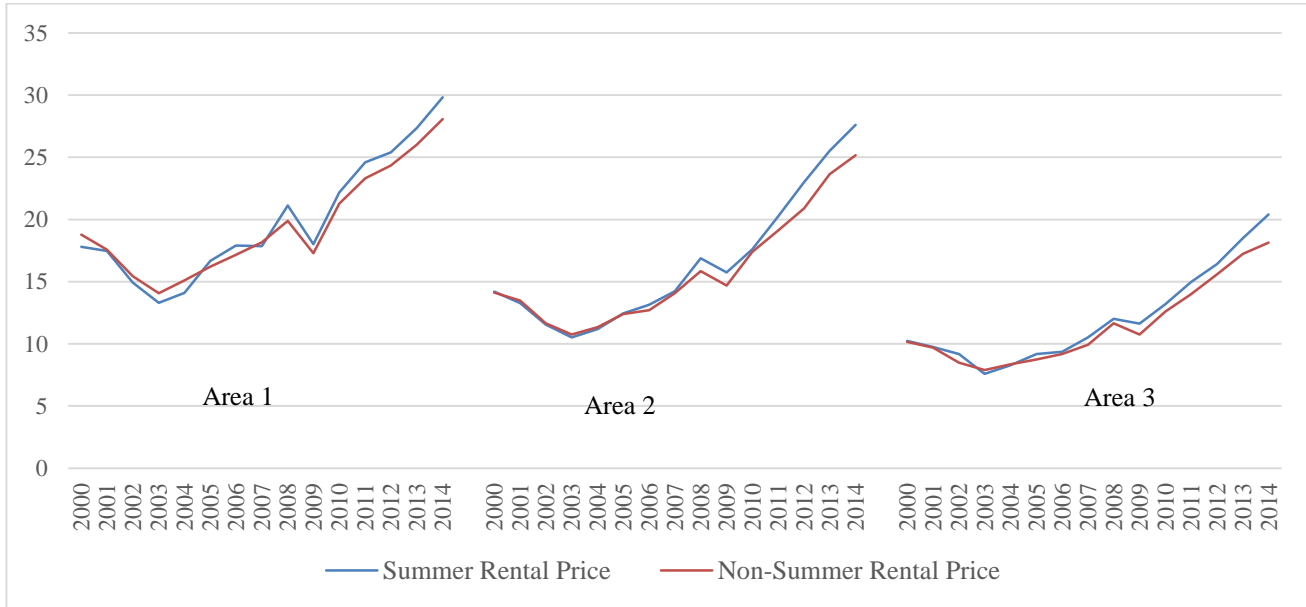
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<sup>8</sup> Although data on student housing before 2013 are unavailable, the spatial pattern of mainland students is very likely to be persistent because students are attracted to areas with a concentration of individuals of similar social status.

<sup>9</sup> We also calculate the results by using other pre-treatments (i.e., pre-treatment period: 2000-2004, 2000-2005, 2000-2007, 2000-2008), but the results remain essentially unchanged.

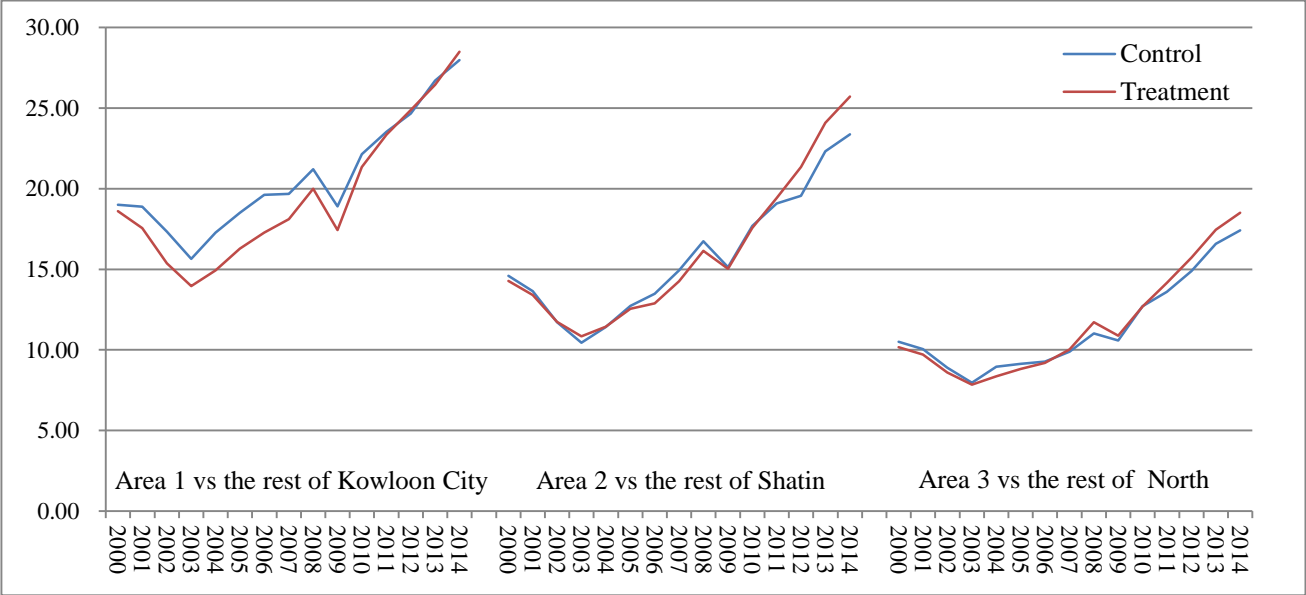


**Figure 5 Summer Rental Price vs Non-summer Rental Price in Clustered Areas Since 2000 (HKD/square feet)**



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

**Figure 6 Comparison of Annual Rental Prices among the Three Areas Since 2000 (HKD/square feet)**



Panel A in Table 6 reports the rental prices for the three comparison groups during the two periods. For changes in rental prices, we use a logarithmic specification, and approximate the percentage supplied to interpret the results as differential percentage changes. The result obtained by using log rent is reported in Panel B. We first compare changes in the summer housing price in the treatment and control neighborhoods. Compared with the average summer price in 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. We also compared the average annual rental prices in the clustered and non-clustered neighborhoods in the two periods, and found that those in the former increase over time by around 10%, a statistically significant increase in all cases. It is not surprising that the increases in annual rental prices would be lower than those for the summer prices.

Beyond the effects of mainland students, there may be other factors that influence the rent in the three comparisons, as briefly discussed in the following. First, non-ERCU students are unlikely to cluster in the same three districts as the ERCU students. The average commuting time from home to university for the ERCU students in this study is around 30 minutes. We 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. Second, mainland professionals are unlikely to choose to live in student-clustered neighborhoods, as these neighborhoods are relatively far in proximity from the CBD. Moreover, the annual number of mainland professionals who are in Hong Kong is less than half of 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 generate a sizable effect on rent at the neighborhood level.

## 6. Conclusion

The housing demand and price effects of migrants are important public policy issues in many countries. However, student visa holders exhibit different characteristics than other migrants in terms of housing consumption. As universities worldwide have seen significant increases in the number of foreign students in recent years, examining the effects of foreign students on the local economy and housing market is useful from a public policy perspective.

**Table 6 Panel A Rent in Student-clustered and Comparable Areas**

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

**Table 6 Panel B Average Log Rents in Student-clustered and Comparable Areas**

	Summer rental price			Annual rental price		
	2000-2006	2013-2014	Change	2000-2006	2013-2014	Changes
Clustered 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)
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)
Clustered Area 2	-0.127***(0.015)	0.046(0.002)	<b>0.173***(0.029)</b>	-0.104**(0.016)	0.004(0.014)	<b>0.109**(0.032)</b>
Rest of neighborhoods in Shatin	2.518 (0.041)	3.284 (0.039)	0.765***(0.082)	2.518 (0.036)	3.215 (0.033)	0.697***(0.073)
Clustered Area 3	2.532 (0.047)	3.150 (0.032)	0.617***(0.094)	2.526 (0.044)	3.128 (0.023)	0.602***(0.088)
Rest of neighborhoods in North District	-0.014(0.012)	0.134***(0.007)	<b>0.148***(0.025)</b>	-0.008(0.010)	0.086***(0.010)	<b>0.095***(0.019)</b>
Clustered Area 1	2.202 (0.038)	2.966 (0.049)	0.765***(0.078)	2.189 (0.034)	2.889 (0.030)	0.700***(0.067)
Rest of neighborhoods in Kowloon City	2.209 (0.040)	2.864 (0.035)	0.655***(0.079)	2.222 (0.034)	2.833 (0.025)	0.611***(0.067)
Clustered Area 2	-0.008(0.010)	0.102***(0.014)	<b>0.110***(0.021)</b>	-0.033**(0.008)	0.056***(0.005)	<b>0.089***(0.015)</b>

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

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

The results here 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 are 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 reduce real wages, housing has become markedly less affordable for low-income residents.

One question left unaddressed in this paper is why students continue to cluster in given neighborhoods after rents rise. Students may value the particular attributes of these neighborhoods, and social interactions are certainly an important factor in housing location choices. The study data show that more than 50% of the students find an apartment through their social networks. The driving force behind their clustered living patterns and the effect of social networks on housing outcomes are left for future studies.

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