INTERNATIONAL REAL ESTATE REVIEW

2018 Vol. 21 No. 3: pp. 343 – 365

Information Barriers, Housing Searches, and Residential Satisfaction: A Study of Mainland China Students in Hong Kong

Zheng Chang
Assistant Professor of Department of Architecture and Civil Engineering, City University of Hong Kong. Address: General Office (B6322), Department of Architecture and Civil Engineering, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong. Email: zchang@cityu.edu.hk

There are few empirical studies that study the effects of different housing search methods on housing outcomes. This paper addresses this research gap by surveying students from Mainland China in Hong Kong to measure residential satisfaction in the use of three different housing search strategies: social media, housing agents, and personal social networks (friends and relatives). We use a structural equation model (SEM) to analyze the results and find that students who use social networks to find houses have a significantly higher level of residential satisfaction than those who use social media as a search method. However, using a housing agent does not significantly affect residential satisfaction, although both the number of houses viewed and time spent during a search have small effects on increasing residential satisfaction.

Keywords

Housing Search, Residential Satisfaction, Structural Equation Model

1. Introduction

A housing search is a complex information-gathering process aimed to find housing opportunities and overcoming information barriers to improve housing outcomes. Economists have developed models to explain for the housing search in terms of housing markets and outcomes related to price, mobility, tenure choice, vacancies, etc. (Genesove and Han, 2012; Piazzesi and Schneider, 2009; Wheaton, 1990; Yinger, 1981). Han and Strange (2015) provide an exhaustive review of the housing search literature, including one-sided search, random matching, and directed search models. Other studies have examined the characteristics of three types of search methods: the Internet, housing agents, and social networks.

The first type of search method, the Internet, has become an important search tool in the home-buying and -renting processes. It has tremendously reduced the information and transaction costs (Carrillo, 2008; Ford *et al.*, 2005) and expanded the information collection capacity of individuals (Baen and Guttery, 1997; Tuccillo, 1997). While few actually purchase a house online, searchers use the Internet largely as a pre-purchase tool to gather basic information. However, there are downsides to this search method. The Internet shifts the distribution of matching values, and people tend to spend more time on searching and search more insensitively (Genesove and Han, 2012; Han and Strange, 2014).

Second, the segmentation and complexity of the housing market often cause information barriers (Arnott, 1987) and buyers without knowledge of the local housing market are more likely to use agents in their search (Benjamin *et al.*, 2007). Anglin (1997) finds that the prior information of buyers and the quality of information from housing agents have a significant effect on search intensity in terms of time and number of houses viewed. Elder *et al.* (1999) also examine the effects of agents on the effectiveness of housing searches. However, Salant (1991) finds that there is a tradeoff in using housing agents: although they can reduce the search time, their service is not free. The commission of the agent determines the demand for using their service.

Finally, social networks are another important channel for housing searches that mitigate the uneven information in the housing market. Most existing studies define *social networks* as friends or relatives and, in the past two decades, research on these networks has increased. For example, labor market research has found that social networks are the most efficient and least costly method for both employers and employees to find new workers/jobs (Granovetter, 1974; Holzer, 1988; Topa, 2001). However, since few studies examine the relationship between social networks and the housing market, we predict that the effect is similar to that in job hunting. Hypothetically, social networks can reduce the search costs for both landlords and renters and increase the odds of finding adequate housing. Liu *et al.* (2013) study the relationship between social

networks and migrant housing in urban China and find that migrants who network with individuals with local *hukou* have more access to better formal housing. Roper *et al.* (2009) show that both buyers and renters are more likely to find desirable houses through their social networks. This might be because social networks enable buyers or renters to obtain specific information on property that satisfies their individual demands or taste.

Overall, while researchers have studied the logistics of each of these housing search methods, empirical studies on the relationship between housing search strategies and their corresponding outcomes are still rare. Nevertheless, residential satisfaction is one of the most important outcomes of housing searches. This paper, therefore, adds to existing studies by examining the effect of different search methods on residential satisfaction.

Scholars have found residential satisfaction to be an important part of life satisfaction (Galster, 1987; Parkes *et al.,* 2002). The extant literature shows that socioeconomic characteristics, housing attributes, and neighborhood characteristics are correlated to residential satisfaction (Dekker *et al*., 2011; Thomsen and Eikemo, 2010). The different neighborhood attributes, including location, public transit accessibility, school and shop availability, and environmental factors, are also important to residential satisfaction (Chapman and Lombard, 2006; Foster *et al*., 2015; Lovejoy *et al*., 2010).

Other studies show that a good match between personal preferences and housing and neighborhood attributes are associated with high residential satisfaction levels and, conversely, a bad match is associated with low satisfaction levels (Jansen, 2013; Kahana *et al*., 2003). Thus, levels of residential satisfaction are closely correlated with the degree of housing market matching. Therefore, the housing strategies that deliver the most useful housing information likely lead to a high level of residential satisfaction. For instance, Roper *et al.* (2009) find that renters tend to be more satisfied when they find a house through social networks rather than through agents. However, the multiple regression approach applied in their study neglects the endogeneity of the housing search method.

To overcome these methodical challenges, this study uses a structural equation model (SEM) to examine the causal effects of different housing search methods on residential satisfaction. The study uses samples from a 2016 cohort survey of Mainland China students in Hong Kong universities (n = 1120). These students often face difficulties in finding a place to live in Hong Kong given information barriers and the expensive housing market. The students surveyed used three channels to find a house: social media, housing agents, and social networks (friends and relatives). Here, social media includes not only the Internet, but also WeChat (a popular Chinese online social media application).

This study examines several determinants on the selection of a method to search for a house to understand the search behavior of students. Then, the study

estimates the effects of different housing search methods on residential satisfaction. The results show that finding houses through social networks (friends and relatives) can significantly enhance residential satisfaction, compared to using social media as the main housing search strategy. Finding a house through agents is associated with a slightly higher residential satisfaction level, although the result is not significant. Finally, although social media has become increasingly popular in the housing market, it is associated with the lowest residential satisfaction. We also find that the number of houses viewed and search time spent have small effects on enhancing residential satisfaction.

In sum, this paper contributes to the extant literature in a few ways. First, the study demonstrates the complexities of the housing search process given information barriers in the rental market. Second, the work examines selection determinants among the different housing strategies and their relationship with search intensity. Third, this study evaluates the causal effect of housing search strategies on residential satisfaction.

Since this study exclusively focuses on strategies and outcomes related to a targeted group of students, one may have concerns that Mainland China students are not fully representative of all buyers and renters in the housing market. We acknowledge their special characteristics and housing preferences that are prevalent among student groups. We believe that our conclusion can be generalized to the context of low income immigrants in rental markets, rather than high income groups who buy property.

This paper is organized as follows: Section 2 describes the housing of Mainland China students in Hong Kong and the data collection process. Section 3 provides an introduction on the framework of the SEM and defines the variables. Section 4 reports the results, and Section 5 concludes.

2. Housing of Mainland China Students in Hong Kong and Data Collection

Since 2000, the Hong Kong government has launched several immigration schemes to attract Mainland professionals and students to Hong Kong for work and study. Accordingly, the number of visas issued to Mainland China students increased drastically, from about 3,000 in 2000 to around 19,000 in 2013 (Immigration Department of Hong Kong, 2013), a number that has remained steady since then.[1] According to the Education Bureau in Hong Kong, Mainland China students account for about 90% of non-local students enrolled in universities. Universities in Hong Kong, meanwhile, are incentivized to accept

[1] Based on statistics from the Immigration Department of Hong Kong (2016), 19,606, 18,528, and 18,887 student visas issued to Mainland students in 2014, 2015 and 2016, respectively.

a large number of Mainland China students, since these students have to pay a higher tuition than local students. The universities are well regarded and have lower tuition than many other private universities in Western countries.[2] For this reason, the number of Mainland China students who study in Hong Kong is likely to remain high.

Despite its educational advantages, Hong Kong is an expensive place to live. The city is surrounded by the China South Sea and 80% of the city's territory is mountainous. This geographical constraint and inelastic land supply contribute to the expensive housing market in Hong Kong. In 2016, 7.3 million people lived in about 1,110 square kilometers, placing a premium on living space. Moreover, the city has a large public housing system, which provides 50% of the housing. Most public units cannot be leased or sold on the market. With roughly 50% of the residents living in private sector units, and the price of these units reaching a historic high, Mainland China students have difficulties in finding affordable places to live and, not surprisingly, most share apartments so that the rent is more affordable.

There are eight universities in Hong Kong. Four are connected by the East Rail lines[3]: the Chinese University of Hong Kong (CUHK), the City University of Hong Kong (CityU), the Hong Kong Baptist University (HKBU), and the Hong Kong Polytechnic University (PolyU). In this study, we refer to these four institutions as the East Rail-connected universities (ERCUs). The commuting time between any two ERCUs is less than 25 minutes. In contrast, the four remaining universities are geographically dispersed, as shown in Figure 1. The red stars indicate the ERCU universities, and yellow stars denote the other universities.[4]

Chang (2017) surveyed the ERCU student cohort from 2013–2014 to determine the housing demand and rental impact of Mainland China students in Hong Kong. He found that Mainland China students in Hong Kong show strong cluster living patterns and that neighborhood housing rent levels are positively associated with their inflow numbers, especially in the summer. However, the study did not address housing search and matching issues.

To understand the housing search process of Mainland China students, we survey the Mainland China student cohort in the ERCUs from 2016–2017. In

[2] The tuition of many self-financing programs in Hong Kong is around 120,000 HKD per year (around 15,000 USD).
[3] The East Rail Line is operated by the Hong Kong Metro Transit Railway Corporation (MTRC) and connects the transportation hub in Kowloon (the Hung Hom Station) to the Lowu Station in Shenzhen.
[4] Other universities are quite similar to the ERCUs in terms of tuition level, number of Mainland China students, and on-campus housing capacity. As a result, Mainland China students at other universities are likely to exhibit personal characteristics and housing search strategies that are similar to those enrolled in the ERCUs.

fall 2016, the Student Residential Offices of the ERCUs supported the data collection by distributing invitation emails to Mainland China students to ask them to complete an online questionnaire survey over a two-week period. Preliminary interviews with about two dozen students formed the basis of the questions used in the survey. All of the respondents are graduate students from Mainland China with typical student access to email and the Internet. A small gift was offered as an incentive for filling out the questionnaire to enhance the response rate.

Figure 1 Location of Hong Kong Universities

The 2016 survey included over two dozen questions related to personal information, housing attributes, and housing search strategies. The findings demonstrate that the housing search process is very complicated and that students tend to use multiple channels to discover housing information.

The questionnaire received over 1,300 replies with a response rate that ranged from 10–30%, depending on the ERCU. We cleaned the raw data based on three principals: we did not include students who are living in school dorms or their own house,[5] students who are studying in Hong Kong for their undergraduate degree, or samples with missing details such as residential address and housing search methods. This gave us a final sample size of 1,120 valid responses.

[5] Several students reported living in their own house in Shenzhen.

Over 90% of the students go through a pre-search process through the Internet and WeChat (a mobile social networking application, similar to WhatsApp). There is a popular website that specializes in rental housing in Hong Kong for Mainland China students,[6] on which students, landlords, and housing agents post leasing and rental information by using their WeChat account. Leasing posts include basic unit characteristics such as price, size, furniture, and location, along with requirements for renters, such as gender and smoking policies. Renter posts are similar in content; they include preferred location and monthly rent and roommate requirements (e.g., gender and habits). Overall, these posts are related to the basic requirements for housing and descriptions of housing quality.

This research defines *social media* as the Internet and WeChat, as students tend to use these platforms interchangeably.[7] In fact, most students connect with their new classmates through social media before school begins. They tend to share living and housing information through various chat groups, as social media makes it possible to share information with large numbers of individuals at the same time and reduces the dependence on distance.

The pre-search can help students to understand the basic housing market conditions, but the information gained is insufficient to make rental decisions. Most students then contact a landlord to acquire more housing information or visit Hong Kong to view houses. Students use one of the three following search methods to find out more information and make decisions after their pre-search: social media (to contact the landlords), housing agents, and social networks (friends or relatives).

Housing information quality is likely to vary depending on the method. For example, social media provides a low-cost search method in terms of both monetary and time costs. However, the information acquired through social media may not be as valuable, because landlords do not have any incentive to disclose all pertinent information. Housing agents can however improve the quality of the information, given their local knowledge, and also have more housing resources available. However, they charge commission fees, typically a month's rent, and tend to increase market prices, which is undesirable for renters (Jud and Frew, 1986). The social networks of the students may solve the information problem without additional monetary cost, but not all students have local friends or acquaintances in Hong Kong.

[6] See http://bbs.gter.net/forum-1033-1.html

[7] WeChat is considered an online social networking tool, however, our survey does not differentiate between WeChat and other Internet networks since students tend to use these platforms interchangeably. WeChat is also an Internet-based online community that shares similar properties, including a reduced cost of communication and faster information diffusion. We classify both as social media to differentiate between the other two housing channels that are discussed here (agents and social networks).

Given the complex and dynamic housing process indicated above, this research uses an SEM to examine the relationship and interaction among the variables. The next section will provide an introduction on the framework of the SEM and define our variables.

3. Framework of SEM and Variables

The SEM has become an increasingly popular tool in planning and housing studies in the past decade, due to its ability to model simultaneous interactions among exogenous and endogenous variables (Cervero and Murakami, 2010; Liu *et al*., 2013). In recent years, the SEM has been applied to analyze residential satisfaction determinants (Cao, 2016; Ren and Folmer, 2017; Wang and Wang, 2016). One notable advantage of the SEM is that it can break down the total effect of a variable into direct and indirect effects through a path analysis.

The following analytic framework is developed based on the housing search process of the Mainland China students, as shown in Figure 2. The framework incorporates the four following relationships/regressions: 1) *residential satisfaction as a function of personal characteristics, housing search process, and housing quality.* Existing studies have shown that both personal characteristics and housing quality are associated with residential satisfaction (Basolo and Strong, 2002; Galster and Hesser, 1981; Lu, 1999). We can estimate the effect of housing searches on residential satisfaction by controlling for personal characteristics and housing quality; 2) *housing quality is determined by personal characteristics and the housing search process;* 3) *the housing search process is characterized by the search methods and corresponding housing intensity (number of houses seen and time on market).* The housing search methods are largely determined by personal characteristics; and 4) *housing search intensity is determined by both personal characteristics and the housing search methods used, as shown in the extant literature* (Anglin, 1997).

As these four relationships or regressions interact with one another, a framework of the SEM is a good option. The paths among the variables indicate their direct and indirect relationships. For example, personal characteristics can directly affect residential satisfaction, since they determine personal housing preferences and taste. However, personal characteristics also affect housing search methods, which in turn affect residential satisfaction. The effect of personal characteristics on residential satisfaction through housing search methods is called the indirect effect. The total effect is the sum of the direct and indirect effects. The definitions of the variables and the statistics are presented in Table 1.

Figure 2 **Analytic Framework**

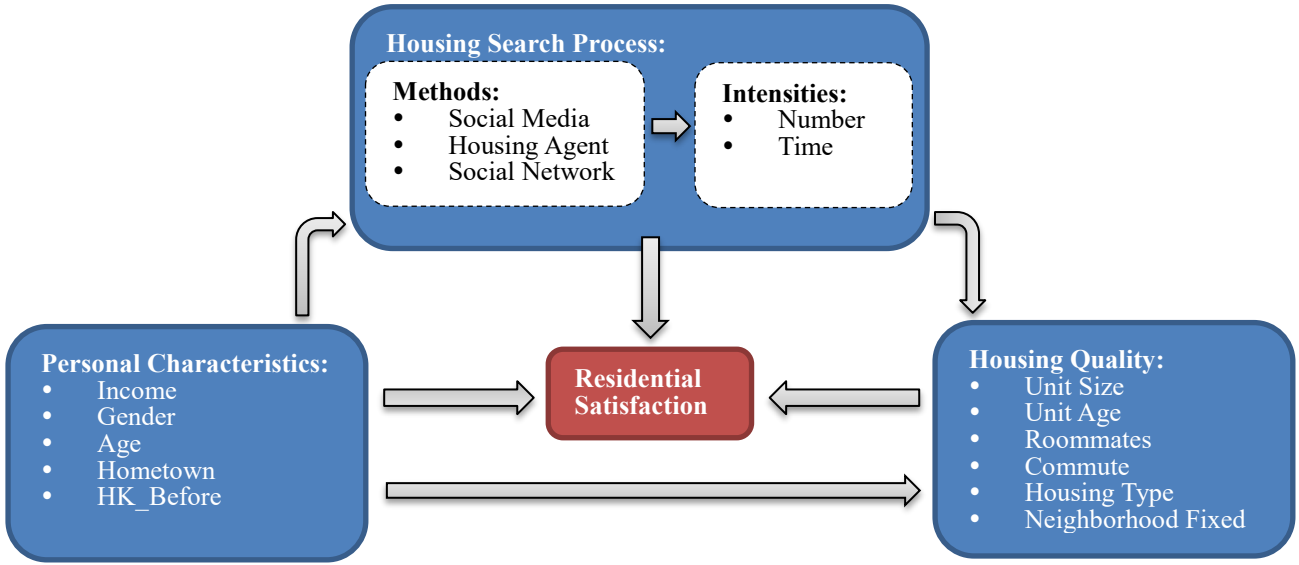

Table 1 Key Variables and Summary Statistics

Variable Name	Description	Housing Agent (N=322)	Social Networks (N=184)	Social Media (N=614)	Total (N=1120)
Characteristic					
Income	Monthly income of Mainland China students, HKD	8877.64 (3037.396)	8694.565 (3498.212)	8105.619 (2411.911)	8424.33 (2821.61)
Age	Age of students, Years Old	23.6646 (2.238)	23.538 (2.0853)	23.6645 (2.1383)	23.6438 (2.1575)
Gender	Binary, 1=Male, 0=Female	0.3106 (0.4634)	0.2935 (0.4566)	0.2296 (0.4209)	0.2634 (0.4407)
Hometown	Distance of hometown of students to Hong Kong, km	1017.236 (697.1915)	1004.88 (697.6811)	1123.534 (715.8952)	1073.39 (709.11)
HK_Before	Binary, 1=Multiple entries to Hong Kong before enrollment, 0 otherwise	0.5031 (0.5008)	0.5598 (0.4978)	0.4137 (0.4929)	0.4634 (0.4989)
Search Process					
Housing Time	Time spent on housing search, months	1.205 (1.231)	1.4511 (1.2922)	1.4723 (1.3082)	1.3919 (1.2882)
Housing Number	Number of houses seen during search	3.1739 (3.3471)	1.4348 (1.6384)	1.3746 (1.9251)	1.9018 (2.5174)
Housing Quality					
Unit_Price	Price per square foot, HKD	26.6709 (4.3091)	25.8783 (5.6507)	25.9977 (4.6504)	26.1716 (4.7432)
Unit Size	Gross floor area, square feet	171.8949 (66.0981)	164.4676 (86.1573)	152.8069 (47.2233)	160.2104 (61.3289)

(Continue…)

(Table 1 Continued)

Variable Name	Description	Housing Agent (N=322)	Social Networks (N=184)	Social Media (N=614)	Total (N=1120)
Unit_Age	Building age, years	25.2051 (13.5945)	28.6494 (14.445)	27.388 (14.3381)	26.9489 (14.1795)
Roommates	Number of students sharing one unit	3.7484 (1.386)	3.5598 (1.436)	3.9658 (1.4731)	3.8366 (1.4495)
Commute	Commuting time to schools, minutes	29.5714 (10.0101)	30.1087 (11.834)	28.9055 (9.6067)	29.2946 (10.1201)
Housing Type					
Large estate	Binary, 1= students living in large scale estate, 0 otherwise	0.8199 (0.3849)	0.6087 (0.4894)	0.6661 (0.472)	0.7009 (0.4581)
Single building	Binary, 1= students living in single building, 0 otherwise	0.0994 (0.2996)	0.1467 (0.3548)	0.1352 (0.3422)	0.1268 (0.3329)
Tong lau	Binary, 1= students living in tong lau, 0 otherwise	0.0497 (0.2176)	0.0652 (0.2476)	0.0765 (0.2661)	0.0669 (0.2501)
Student hotel	Binary, 1= students living in student hotel, 0 otherwise	0.0155 (0.1238)	0.0924 (0.2904)	0.07 (0.2554)	0.058 (0.2339)
Village house	Binary, 1= students living in village house, 0 otherwise	0.0155 (0.1238)	0.0543 (0.2273)	0.0472 (0.2123)	0.0393 (0.1944)
Public Housing	Binary, 1= students living in public housing, 0 otherwise	0	0.0326 (0.1781)	0.0049 (0.0698)	0.08 (0.0893)
Outcome					
Satisfaction	Residential Satisfaction; 1 to 5	3.6491 (0.788)	3.7446 (0.7858)	3.5847 (0.8859)	3.6295 (0.8441)

Note: Numbers in parentheses refer to standard deviation.

The personal characteristic variables are exogenous, thus affecting all other variables for the three groups. This study draws direct paths between personal characteristics and other variables, including the monthly income, gender, age, and hometown distance to Hong Kong (log) of the students, and whether they had previously visited Hong Kong (dummy). Their average monthly income is approximately 8,400 HKD per month, which is less than the bottom 10th percentile of the income of local residents (which was around 9,000 HKD in 2016 (Census and Statistics Department of Hong Kong, 2016). The average age of the students is 23.64 years old. According to statistics from the Education Bureau in Hong Kong, the male student percentage from Mainland China has been approximately 30% since 2010. The percentage of males in the sample in this study is approximately 26%, which is close to the overall student population percentage. The physical distance from the hometown of the students to Hong Kong ranges from 17 to 3,654 kilometers. This variable can be used to indicate the cost of commuting to Hong Kong, which is relevant for the selection of housing search method. Students who made multiple trips to Hong Kong before enrollment is the dummy variable which shows their familiarity with the housing market in Hong Kong. The survey responses showed that 46% of the students had visited Hong Kong prior to starting classes, and they clearly had more channels to find housing.

The housing search process is endogenous. It is also the mediating variable, which links personal characteristics and housing quality. The housing search process includes both housing search methods (social media, housing agent, and social networks) and housing search intensity (time spent on search and number of houses seen). The survey shows that 55% of the students find houses through social media by directly contacting landlords and sublandlords. About 29% of the students find a house with the help of a housing agent, although most students contact agents through social media. The remaining 16% find a house through their own social networks. On average, students require 1.4 months to find a house and see 1.9 houses before signing a rental agreement. As each housing search method is likely to be associated with different housing search intensity, this research draws a direct path from housing search variables to housing search intensity.

Housing quality is also endogenous, as it is determined by personal characteristics and the housing search process. It includes housing attributes such as housing unit type, size, and age, along with the number of roommates per unit and commuting distance to the schools. There are several types of housing units based on quality and ownership structure, including large-scale estates, single buildings, tong lau (or qi lou; tenement buildings constructed from the late 19th century to the 1960s) student hotels, village houses, and public housing.[8] Student housing units have an average gross floor area of 583

[8] Seventy percent of the students live in private, larger-scale estates; 13% in single buildings, which are small-scale mid- or high-rise apartments; almost 7% in tong lau, which are low-rise apartments built in the 1960s; about 6% in hotels; 4% in village

square feet, and the average building age in 2016 was 27 years old.[9] On average, 3.84 students share one unit. Over 80% of the students commute to school by taking public transportation, with an average commuting time of nearly 30 minutes.

There are over 200 geographic tertiary planning units (TPUs) in Hong Kong. Each TPU can be considered as a neighborhood, since each has specific demographic characteristics and housing attributes, according to the government census. Mainland China students live in about 71 TPUs, in which the average size is about 2.089 square kilometers. To capture the unobservable location attributes, we added the neighborhood fixed effect (a set of dummies) into the framework of the SEM.

Finally, the outcome of this model is residential satisfaction. Personal characteristics, housing search process, and housing quality are all related to residential satisfaction. Thus we draw three direct paths that connect those variables. In the survey, the residential satisfaction ranges from 1 to 5 (least satisfied to most satisfied). The average score is 3.63, with a standard deviation of 0.84.

4. Empirical Results

The SEM estimation shows all of the dependencies among the endogenous and exogenous variables. The model fits the data quite well since it passes several criterions in terms of goodness of fit. For example, the root mean squared error of approximation (RMSEA) is 0.067, root mean squared residual (SRMR) is 0.043, and Cook's D (CD; similar to R^2 in OLS regressions) is 0.636.[10] As the preliminary goal is to understand the relationship between housing search and residential satisfaction, the results only report coefficients on variables related to this finding. All results reported below are standardized, including the direct, indirect, and total effects.

Housing Search Process Determinants

The effect of personal characteristics on the housing search process is shown in Table 2. Among the three housing search methods, social media is used as a comparable reference.

houses, which are generally two- or three-level structures built in the rural areas; and 1% live in public housing units.

[9] This number does not include the unit age for village houses, which are not publicly available, since these houses are built by indigenous villagers. Other unit ages can be found through the Centaline Property Agency Limited website, which is the largest housing vendor in Hong Kong.

[10] An RMSEA lower than 0.05 indicates a good fit, while a number between 0.05 and 0.1 indicates a reasonable fit. An SRMR lower than 0.08 indicates a good fit.

Table 2 Standardized Effects on Variables in Housing Search Process

	(1) Agent	(2) Social Network	(3) log(Housing Number)	(4) Housing Time
Direct Effect				
log(Income)	0.1792***	0.0033	0.1622**	-0.4904***
	(0.0479)	(0.0390)	(0.0744)	(0.1336)
Gender	0.0732**	0.0228	0.0403	-0.0419
	(0.0322)	(0.0262)	(0.0498)	(0.0894)
Age	-0.002	-0.0035	-0.0028	-0.0471**
	(0.0068)	(0.0055)	(0.0105)	(0.0188)
log(Hometown)	-0.0232*	0.006	-0.0693***	0.0056
	(0.0125)	(0.0102)	(0.0193)	(0.0346)
HK_Before	0.0025	0.0694***	0.2096***	0.0189
	(0.0307)	(0.0250)	(0.0475)	(0.0853)
Agent	-	-	0.4366***	-0.2034**
			(0.0492)	(0.0883)
Social Network	-	-	-0.0084	-0.0016
			(0.0605)	(0.1086)
Indirect Effect				
log(Income)	-	-	0.0782***	-0.0364*
			(0.0227)	(0.0187)
Gender	-	-	0.0318**	-0.0149
			(0.0147)	(0.0100)
Age	-	-	-0.0008	0.0004
			(0.0030)	(0.0015)
log(Hometown)	-	-	-0.0102*	0.0047
			(0.0056)	(0.0032)
HK_Before	-	-	0.0005	-0.0006
			(0.0141)	(0.0098)
Agent	-	-	-	-
Social Network	-	-	-	-
Total Effect				
log(Income)	0.1792***	0.0033	0.2404***	-0.5268***
	(0.0479)	(0.0390)	(0.0768)	(0.1330)
Gender	0.0732**	0.0228	0.0720	-0.0568
	(0.0322)	(0.0262)	(0.0516)	(0.0894)
Age	-0.002	-0.0035	-0.0036	-0.0466**
	(0.0068)	(0.0055)	(0.0109)	(0.0189)
log(Hometown)	-0.0232*	0.006	-0.0795***	0.0103
	(0.0125)	(0.0102)	(0.0200)	(0.0347)
HK_Before	0.0025	0.0694***	0.2101***	0.0182
	(0.0307)	(0.0250)	(0.0491)	(0.0852)
Agent	-	-	0.4366***	-0.2034**
			(0.0492)	(0.0883)
Social Network	-	-	-0.0084	-0.0016
			(0.0605)	(0.1086)

Notes: Number of observations is 1074. Empty cells indicate no direct links between two variables. Social media is taken as the reference group. The numbers in parentheses are standard errors. *** denotes a coefficient significant at the 1% level, ** denotes a coefficient significant at the 5% level, and * denotes a coefficient significant at the 10% level.

Columns 1 and 2 show that students with high income levels are more likely to use a housing agent as their main strategy, and this result is very significant. Men are more likely to use housing agents as their preferred search method than women. Age does not affect choice of housing search method. Students whose hometown is far away from Hong Kong are more likely to use social media rather than housing agents to find houses. Students who have made multiple previous visits to Hong Kong are more likely to find a house through social networks rather than other housing search methods, and this result is statistically significant at the 1% level. As personal characteristics can directly affect housing search channels, all coefficients can be interpreted as direct effects.

Columns 3 and 4 show the coefficients of housing search intensity determinants. Independent variables include both personal characteristics and housing search methods. The effects of personal characteristics on housing search intensity are both direct and indirect (through housing search methods). The table shows that student income levels are positively and strongly associated with the number of houses seen, but negatively related to the time spent on searching for a house. Gender does not have a significant relationship with housing search intensity. Older students tend to spend less time finding a house, and this result is significant at the 5% level. Hometown distance to Hong Kong is negatively associated with the number of houses seen in Hong Kong, and the result is significant at the 1% level. Students who have previously visited Hong Kong tend to see more houses during their search, and this result is also significant at the 1% level. Compared to those who use social media as a search strategy, students who rely on a housing agent tend to spend less time searching and see more houses. However, students who use social networks as their main strategy have similar housing search intensity as those who use social media to find a house.

These results suggest that benefits and costs matter when choosing housing search strategies. For example, high-income students tend to find their house through housing agents rather than other housing search methods. As housing agents charge commission fees, low-income students may not be willing to pay the extra cost.[11] However, finding houses through housing agents is less time consuming and the number of houses seen is significantly higher, which may be attractive to high-income students. For students who live far from Hong Kong, commuting to Hong Kong to see houses is costly. Thus, they are more likely to use social media to find a house, since this method does not cost anything. However, these students see fewer houses and spend more time searching on social media. It seems that the benefits from social media are

[11] One may be concerned that the commission fees may increase housing rent. Table 1 shows that while students with agents pay slightly higher rent than others, they also enjoy a larger unit size and their unit age is relatively lower. Therefore, we cannot conclude that the commission fee increases subsequent rent.

limited, because students who are familiar with Hong Kong tend to find houses through their social network rather than social media.

Residential Satisfaction Determinants

Different housing search methods are associated with different kinds of information. For example, social networks and local agents deliver useful information given their local knowledge and relatively plentiful housing resources. Information acquired from social media is limited, since landlords only post very basic information online. This section will examine the relationship between housing search methods and residential satisfaction by using social media as a comparable reference. Table 3 reports the results on the coefficients of different determinants with respect to residential satisfaction.

Personal characteristic variables have both direct and indirect effects on residential satisfaction. The indirect effects are through either housing search process or housing quality variables. Personal income is positively associated with residential satisfaction, although indirectly so. Men are less satisfied with their current living conditions than women. Older students have lower residential satisfaction than younger students, and this result is very robust. The distance of the hometown of students to Hong Kong is negatively associated with residential satisfaction, and this is mainly from its direct effect. Students who have previously visited Hong Kong have high residential satisfaction levels and both the indirect and total effects are significant.

Housing quality variables only have a direct effect on residential satisfaction. The unit size is positively associated with residential satisfaction, but the result is not significant. Both the number of roommates and the unit age are significantly and negatively associated with residential satisfaction. The commuting time to school has a small negative effect on residential satisfaction, which seems to be the result of the low opportunity cost of commuting for Mainland China students. All results control for housing type and fixed neighborhood effect.

Lastly, housing search process variables have both direct and indirect effects on residential satisfaction, and the indirect effects are through variables on housing quality. Compared to those who find a house through social media, students who use housing agents are associated with a slightly higher level of residential satisfaction, although the result is not significant. In contrast, students who find a house through their social networks are significantly associated with high residential satisfaction levels. This indicates that obtaining housing information through social networks is more likely to match preferences, since residential satisfaction when using social networks is largely from its direct effect. However, both the number of houses seen and time spent on housing searches have a small positive effect on improving residential satisfaction, but neither is significant.

Table 3 Standardized Effects on Determinants of Residential Satisfaction

	(1) Direct Effect	(2) Indirect Effect	(3) Total Effect
Personal Characteristic			
log(Income)	0.0044	0.1237*	0.1280
	(0.0991)	(0.0676)	(0.0904)
Gender	-0.1488**	-0.0157	-0.1645***
	(0.0587)	(0.0328)	(0.0607)
Age	-0.0497***	-0.0049	-0.0545***
	(0.0128)	(0.0076)	(0.0128)
log(Hometown)	-0.0388*	0.0003	-0.0385*
	(0.0222)	(0.0117)	(0.0236)
HK_Before	0.0734	0.0849***	0.1584***
	(0.056)	(0.0314)	(0.0579)
Housing Quality			
log(Unit Size)	0.1816	-	0.1816
	(0.1114)		(0.1114)
log(Unit Age)	-0.1152*	-	-0.1152*
	(0.0617)		(0.0617)
Roommates	-0.0556**	-	-0.0556**
	(0.0274)		(0.0274)
log(Commute)	-0.0396	-	-0.0396
	(0.1206)		(0.1206)
Housing Type	Y	-	Y
Neighborhood Fixed Effect	Y	-	Y
Housing Search Process			
Agent	0.0116	0.0343	0.0459
	(0.0602)	(0.0260)	(0.0656)
Social Network	0.1299*	0.0263	0.1562**
	(0.0716)	(0.0308)	(0.0779)
log(Housing Number)	0.0472	-0.0068	0.0404
	(0.0355)	(0.0155)	(0.0388)
Housing Time	0.0174	0.0007	0.0181
	(0.0197)	(0.0086)	(0.0215)

Notes: Number of observations is 1074. Empty cells indicate no direct links between two variables. Social media is reference group. Number in parentheses is standard error. *** denotes coefficient is significant at 1% level, ** denotes coefficient is significant at 5% level, and * denotes coefficient significant at 10% level.

5. Discussion and Conclusions

Housing search processes tend to lead to useful information and help renters decide on a set of housing attributes that better match their preferences. By using a sample of Mainland China students in Hong Kong, this paper analyzes the housing search process and its effect on residential satisfaction. The paper uses a framework of the SEM to resolve the interactions among different variables.

The main findings are summarized as follows: the housing strategy adopted by the students is based on the relative benefits and cost of each channel and prior local knowledge of the local market. Those who use housing agents to find a house viewed more houses and spent less time searching. Using social media takes more time, which is consistent with findings in existing studies.

The quality of information varies from each method used. Social networks provide the most useful housing information, which significantly enhances residential satisfaction. Although social media has gained in popularity as a real estate tool, this study shows that it provides relatively small benefits for students and, by implication, others who are seeking housing information. Although housing agents have the advantage of more housing resources, the benefits are also relatively small, and the service is not free. Both the number of houses seen and time spent on searching have small effects on residential satisfaction. This suggests that the housing search method is critical for individual housing outcomes rather than housing search intensity.

Why do personal social networks offer better housing information than housing agents? As professional participants, housing agents are familiar with the local housing markets and provide more housing resources. In comparison, social networks are associated with fewer room visits (as shown in Column 3 of Table 2). The main reason for this is that housing agents charge both landlords and tenants. A housing agent aims to close the deal rather than disclosing all relevant information to the tenant. In our interview of Mainland China students, we find that housing agents sometimes strategically lie to the tenant as a tactic. This strategy may explain why social networks outperform housing agents. Han and Strange (2014) also point out that housing agents have incentive to maximize their broker fee, which can raise a series of incentive alignment problems and result in a loss of welfare for their clients.

In sum, this study provides a new perspective for understanding the housing search process. The study makes several contributions to the existing literature. First, most of the extant literature studies the housing search and preference matching separately. In comparison, this paper directly examines the effect of search methods on the results of matching (indicated by residential satisfaction). Second, the positive role of social networks on residential satisfaction is not surprising. The literature on social networks has found that social networks

have a positive effect on finding a job. This study therefore enriches the understanding of social networks in the search for housing. Third, SEMs are not new, but have been seldom used in housing market studies. Future studies could apply a similar methodology to examine more complex housing search issues. Finally, this study focuses on information barriers during the housing search, and finds that the information obtained through different methods varies in quality. These empirical findings can be generalized to apply to others who face information barriers with respect to local rental markets.

This study could be expanded in several ways. First, pre-searches are relevant to formal search and housing outcomes, and future studies should examine the role of pre-searching on the housing process. Second, this study does not differentiate between the Internet and WeChat. Although the effect of WeChat on housing satisfaction is likely to be weak, this app may have different roles with respect to collecting and diffusing housing information compared to the other housing search methods. Therefore, future studies can focus on the effect of this channel on housing outcome. Third, we do not measure peer effects on housing decisions, which is surely important, as suggested by Patacchini and Venanzoni (2014). Fourth, the number of connections and relationships that are found in social networks (such as relationships with strong and weak ties) can affect housing searches and outcomes. Finally, the findings of this study are likely to be generalized to low income immigrants who do not have much knowledge of local housing in the rental market. Other social groups, especially high income groups and house buyers, may have very different housing search processes and residential satisfaction levels. The examination of other groups is left for future studies.

Acknowledgement

The work described in this paper is funded by a City University of Hong Kong Strategic Research Grant (Project No.7004626). The author thanks Mr. Yifu Ou and Sheng Chen for their excellent research assistance in data collection and cleaning at the City University of Hong Kong.

References

Anglin, P. (1997) Determinants of Buyers Search in a Housing Market, *Real Estate Economics*, 25 (4), 567-589.

Arnott, R. (1987) Economic Theory and Housing, in E. S. Mills (Ed.), *Handbook of Regional and Urban Economics*, 959-988, Amsterdam.

Baen, J. and Guttery, R. (1997) The Coming Downsizing of Real Estate: Implications of Technology, *Journal of Real Estate Portfolio Management*, 3 (1), 1-18.

Basolo, V. and Strong, D. (2002) Understanding the Neighborhood: from Residents' Perceptions and Needs to Action, *Housing Policy Debate*, 13(1), 83-105.

Benjamin, J.D., Chinloy, P. and Winkler, D. T. (2007) Sorting, Franchising and Real Estate Brokerage Firms, *Journal of Real Estate Finance and Economics*, 34 (2), 189-206.

Cao, X.Y. (2016) How does Neighborhood Design Affect Life Satisfaction? Evidence from Twin Cities, *Travel Behaviour and Society*, 5, 68-76.

Carrillo, P.E. (2008) Information and Real Estate Transactions: The Effects of Pictures and Virtual Tours on Home Sales. George Washington University Working Paper.

Census and Statistics Department of Hong Kong (2016). 2016 Report on Annual Earnings and Hours Survey, see:https://www.statistics.gov.hk/pub/B10500142016AN16B0100.pdf

Cervero, R. and Murakami, J. (2010) Effects of Built Environments on Vehicle Miles Rraveled: Evidence from 370 US Urbanized Areas, *Environment and Planning A*, 42 (2), 400-418.

Chang, Z. (2017) Non-Local Students, Housing Demand and Rental Impact: Evidence from Mainland Students in Hong Kong, *International Real Estate Review*, 20 (4), 525-548.

Chapman, D. W. and Lombard, J. R. (2006) Determinants of Neighborhood Satisfaction in Fee-Based Gated and Nongated Communities, *Urban Affairs Review*, 41 (6), 769-799.

Dekker, K., De Vos, S., Musterd, S. and Van Kempen, R. (2011) Residential Satisfaction in Housing Estates in European Cities: A Multi-Level Research Approach, *Housing Studies*, 26(04), 479-499.

Elder, H.W., Zumpano, L.V. and Baryla, E.A. (1999) Buyer Search Intensity and the Role of the Residential Real Estate Broker, *Journal of Real Estate Finance and Economics*, 18 (3), 351-368.

Ford, J.S., Rutherford, R.C. and Yavaş, A. (2005) The Effects of the Internet on Marketing Residential Real Estate, *Journal of Housing Economics*, 14 (2), 92-108.

Foster, S., Pereira, G., Christian, H., Knuiman, M., Bull, F. and Giles-Corti, B. (2015) Neighborhood Correlates of Sitting Time for Australian Adults in New Suburbs: Results from Reside, *Environment and Behavior*, 47 (8), 902-922.

Galster, G. (1987) Identifying the Correlates of Dwelling Satisfaction: An Empirical Critique, *Environment and Behavior*, 19(5), 539-568.

Galster, G.C. and Hesser, G.W. (1981) Residential Satisfaction Compositional and Contextual Correlates, *Environment and Behavior*, 13(6), 735-758.

Genesove, D. and Han, L. (2012) Search and Matching in the Housing Market, *Journal of Urban Economics*, 72(1), 31-45.

Granovetter, M., 1974. *Getting a job: A Study of Contacts and Careers*. (Harvard University Press: Cambridge, Massachusetts).

Han, L. and Strange W.C. (2014) Bidding Wars for Houses, *Real Estate Economics*, 42 (1), 1-32.

Han, L. and Strange, W.C. (2015). The Microstructure of Housing Markets: Search, Bargaining, and Brokerage. In: Duranton, G., Henderson, J.V., and Strang, W. (Eds.), *Handbook of Regional and Urban Economics* 813-886 (Elsevier: Amsterdam).

Holzer, H.J. (1988) Search Method Use by Unemployed Youth, *Journal of Labor Economics*, 6 (1), 1-20.

Immigration Department of Hong Kong (2016), see https://www.immd.gov.hk/publications/a_report_2016/chs/appendices-05.html

Immigration Department of Hong Kong (2013) Immigration Department Annual Report 2013, see https://www.immd.gov.hk/publications/a_report_2013/en/foreword/vision.html

Jansen, S.T. (2013) Why is Housing always Satisfactory? A Study into the Impact of Preference and Experience on Housing Appreciation, *Social Indicators Research*, 113(3), 785-805.

Jud, G.D. and Frew, J. (1986). Real Estate Brokers, Housing Prices, and the Demand for Brokers, *Urban Studies*, 23(1), 21-31.

Kahana, E., Lovegreen, L., Kahana, B. and Kahana, M. (2003) Person, Environment, and Person-Environment Fit as Influences on Residential Satisfaction of Elders, *Environment and Behavior*, 35(3), 434-453.

Liu, Z.L, Wang, Y.J. and Tao, R. (2013) Social Capital and Migrant Housing Experiences in Urban China: A Structural Equation Modeling Analysis, *Housing Studies*, 28 (8), 1155-1174.

Lovejoy, K., Handy, S. and Mokhtarian, P. (2010) Neighborhood Satisfaction in Suburban versus Traditional Environments: An Evaluation of Contributing Characteristic in Eight California Neighborhoods. *Landscape and Urban Planning*, 97(1), 37-48.

Lu, M. (1999) Determinants of Residential Satisfaction: Ordered Logit vs. Regression Models, *Growth and Change*, 30(2), 264-287.

Parkes, A., Kearns, A. and Atkinson, R. (2002). What Makes People Dissatisfied with Their Neighbourhoods? *Urban Studies*, 39(13), 2413-2438.

Patacchini, E. and Venanzoni, G. (2014) Peer Effects in the Demand for Housing Quality, *Journal of Urban Economics*, 83, 6-17.

Piazzesi, M. and Schneider, M. (2009) Momentum Traders in the Housing Market: Survey Evidence and a Search Model, *The American Economic Review*, 99 (2), 406–411.

Planning Department of Hong Kong (2015) Land Utilization in Hong Kong 2015. Available at:
http://www.pland.gov.hk/pland_en/info_serv/statistic/landu.html

Roper, A., Volker, B. and Flap, H. (2009) Social Networks and Getting a Home: Do Contacts Matter? *Social Networks*, 31 (1), 40-51.

Ren, H.H. and Folmer, H. (2017) Determinants of Residential Satisfaction in Urban China: A Multi-Group Structural Equation Analysis, *Urban Studies*, 54 (6), 1407-1425.

Salant, S. W. (1991) For Sale by Owner: When to Use a Broker and How to Price the House. *Journal of Real Estate Finance and Economics*, 4 (2), 157-174.

Thomsen, J. and Eikemo, T.A. (2010). Aspects of Student Housing Satisfaction: A Quantitative Study, *Journal of Housing and Built Environment*, 25(3), 273-293.

Topa, G. (2001) Social Interactions, Local Spillovers and Unemployment. *The Review of Economic Studies*, 68 (2), 261-295.

Tuccillo, J. (1997) Technology and the Housing Market. Business Economics, 32 (3), 17-20.

Wang, D. and Wang, F. (2016) Contributions of the Usage and Effective Experience of the Residential Environment to Residential Satisfaction. *Housing Studies*, 31 (1), 42-60.

Wheaton, W. C. (1990) Vacancy, Search, and Prices in a Housing Market Matching Model, *Journal of Political Economy*, 98 (6), 1270–1292.

Yinger, J. (1981) A Search Model of Real Estate Broker Behavior, *American Economic Review*, 71 (4), 591-605.