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Abstract

Using a novel dataset involving 450 respondents living in affordable apartments in urban Hanoi, this study examines the level of housing satisfaction and its correlates. We find that housing satisfaction is positively associated with household income but negatively related to education. Interestingly, the study finds that residents borrowing from banks to buy home are less satisfied with their home than their non-borrowing counterparts. We also find that respondents' positive evaluation of their apartments, such as the design, construction quality and price of apartments, are strongly linked with housing satisfaction. In addition, the location of and environmental quality surrounding the housing area were found to be major factors affecting housing satisfaction.

Keywords: *affordable apartment, housing satisfaction, social apartment, cheap commercial apartment*

JEL codes: D4, D6, D11

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1. Introduction

Housing is commonly considered as a key health resource and an important determinant of overall quality of life (Dunn, 2002; Ellaway & Macintyre, 1998; Evans, Wells, & Moch, 2003; Macintyre, Ellaway, Der, Ford, & Hunt, 1998). Housing satisfaction has been noted as one of the central factors of individuals' general quality of life. Thus, the extent to which individuals' needs and aspirations are met by their housing conditions is a concern for both researchers and housing developers (Baiden, Arku, Luginaah, & Asiedu, 2011). In developed countries, planners and policy makers try to ensure housing conditions to be satisfied by the needs of their residents and thereby contributing to their quality of life (Ginsberg & Churchman, 1984).

Rapid population growth and urbanization have resulted in a huge deficit of quality housing in Vietnam. It is estimated that about 20 percent (approximately 4.8 million households) of Vietnam's 24.2 million households live in poor accommodation. Especially, the housing shortage is likely to increase as the number of urban households are projected to increase to 10.1 million in 2020 (from 8.3 million in 2015) and the proportion of urban population is projected to reach 50 % by 2040. This means that about 374000 additional units are needed in cities annually (WB, 2015). Affordability analysis based on income groups reveals that households at lower and middle income quintiles cannot afford commercial apartments (WB, 2015). Thus, affordable apartments (social and cheap commercial housing) have been in huge demand in Vietnam's big cities (An & Hung, 2016)².

While the supply of affordable units has been rapidly increased in recent years, their poor quality has become an urgent matter for both consumers and planners in Vietnam (Hoa, 2016; Le, Ta, & Dang, 2016). Previous evidence confirms that housing quality is a crucial

² In the current study, affordable apartments mean housing for low and middle income households, which were defined according to the Resolution No. 02/NQ-CP on January 7th 2013 and WB (2015). Low-income housing is housing with price less than 16 million VND per square meter, while medium-income housing is from 16-30 million VND per square meter

factor affecting housing satisfaction in most countries (Amole, 2009; Baiden et al., 2011; Francescato, Weidemann, & Anderson, 1989). Yet, there has been many studies examining housing satisfaction in developed economies (Baillie, 1990; Lu, 1998; Thomsen & Eikemo, 2010), little is known on housing satisfaction in the context of developing countries where housing characteristics and quality are generally much poorer than those in developed countries (Amole, 2009; Baiden et al., 2011). This gap in the literature motivates us to conduct the current study. Our study is an original research that examines housing satisfaction and their correlates among those living in affordable apartments in urban Hanoi, Vietnam. To the best of the authors' knowledge, our study is the first one to investigate housing satisfaction and its determinants in Vietnam.

The study objectives are: (1) to measure the level of housing satisfaction among those living in affordable apartments in Hanoi, Vietnam, (2) to identify what factors affect housing satisfaction? Our study has policy implications as the Vietnamese government (and other developing countries) strives to implement housing policies that can help improve housing satisfaction, which in turn increases the quality of life of the urban-low income population. The paper is structured as follows: the next section presents the data and analytic methods. Results and discussion are given in Section 3. Conclusion and policy implications are provided in Section 4.

2. Data and analytic methods

2.1. Study site and data collection

This study was conducted in six districts of Hanoi: North Tu Liem, South Tu Liem, Hoang Mai, Long Bien, Ha Dong and Thanh Xuan. The six districts were selected because there are both social apartment and cheap commercial apartment projects in these districts. In each selected district, one social apartment project and one cheap commercial apartment project

were randomly selected. Because the number of cheap commercial apartments is roughly as twice as that of social apartments in six selected districts, 25 households living in the selected social apartment project and 50 households living in the selected cheap commercial apartment project were randomly selected, yielding a total of 450 households. The survey was carried out from the beginning of July to the end of September 2016, and the data were collected by means of face-to-face interviews with the head of a household in the presence of other household members.

40 economics students from University of Economics and Business, Vietnam National University were carefully selected and trained to become official members of a fieldwork team. These students were very competent and experienced in fieldwork in Vietnam's urban areas. After the training courses, 30 out of 40 trainees were officially employed, forming a fieldwork team of 24 interviewers and 6 survey supervisors. Two training courses (one week before and one week after the pilot survey) were held to provide trainees with a thorough understanding of the survey context and purposes; contents of all questions in the questionnaire; and requirements and expectations of interviewers. In addition, the training courses provided trainees with further necessary skills for the survey and included practice, using the questionnaire, in interviewing actual households.

A pilot test was implemented, including a test of questionnaire design, fieldwork and data entry plans. It involved interviewing 30 households living in cheap commercial apartments and 10 households living in social apartments. For each interviewer, at least one of their pilot interviews was conducted in the presence of a survey supervisor. After the pilot test, a meeting was held over one day in which the interviewers, survey supervisors and author discussed any problems occurred during the pilot test. Based on the results from the pilot test, some final edits were made to the questionnaire. Useful and valuable experiences in

interview practice or techniques that were performed well during the pilot interviews were imparted to all other interviewers. Six survey supervisors and the authors participated in checking for mistakes to ensure the accuracy and quality of survey data and data entry.

2.2. Analytical methods

The main statistical analyses applied were descriptive statistics and multiple regression. The regressions were used to examine what factors associated with housing satisfaction among those living in affordable apartments in the study area. The outcome variable in our study is housing satisfaction scores of respondents, obtained from a multiple-choice question: “Taken all together, how are you satisfied with your apartment at present?” The five possible responses to the question are “very dissatisfied”, “dissatisfied”, “neither satisfied nor dissatisfied”, “satisfied”, and “very satisfied”. For our analysis, housing satisfaction is constructed with a value ranging from 1 to 5, corresponding to “very dissatisfied”, “dissatisfied”, “neither satisfied nor dissatisfied”, “satisfied”, and “very satisfied”, respectively.

Subjective satisfaction can be used as cardinal or ordinal, depending on researchers’ assumption (Ferrer-i-Carbonell & Ramos, 2014) and the results of econometric analysis are robust to both methods of a linear or an ordered categorical estimator (Ferrer-i- Carbonell & Frijters, 2004). Because Ordinary Least Squares (OLS) coefficients directly display the marginal effects and thus are more intuitive and interpretable by a wide range of researchers (Wooldridge, 2013), we used OLS models to investigate factors affecting housing satisfaction. In addition, ordered logit models were performed to check for the robustness to the model specifications and the results are reported in the Appendix.

The literature shows that the level of housing satisfaction is determined by three groups of factors (Addo, 2015; Baiden et al., 2011; Diaz-Serrano, 2006; Galster, 1987): (i)

objective attributes of the individual or household, i.e. personal and socioeconomic characteristics; (ii) objective characteristics of the environment, i.e. dwelling and neighborhood characteristics, and; (iii) individual's subjective perceptions, valuations and aspirations. Although the two first groups of factors have been widely examined in the existing literature, variables belonging to the third group have been rarely used (Baiden et al., 2011; Diaz-Serrano, 2006). Following the literature, the three groups of variables potentially affecting residential satisfaction were included in our regression analysis. The following equation was used to estimate factors affecting housing satisfaction:

$$Satisfaction (Si) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i \quad (1)$$

Following previous studies about customer satisfaction (Heikkilä et al., 2016; Bamber., 2014), we also examine residents' satisfaction with their chosen apartments by asking them with an additional question that: "*if you were making the choice again, would you still choose the same apartment?*". The main purpose of this question is to check for the robustness of the outcomes. This is because higher satisfaction is expected to be closely linked with higher likelihood of choosing the current apartment. In this case, the response variable a binary variable taking on the value one for buying and the value zero for not buying. Thus, a logit model is used to examine factors associated with this decision:

$$Decision (Di) = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \mu_i \quad (2)$$

In equations 1 and 2, X_{1i} is the vector of individual and household characteristics, X_{2i} is a set of variables reflecting the physical characteristics and respondents' subjective evaluation of their apartments, Si represents the respondent's self-reported housing satisfaction while Di denotes the decision whether the residents would choose the same apartment or not. β_i and α_i are parameters that are needed to be estimated. ε_i and μ_i are the error terms in

equations 1 and 2, respectively. The error terms are likely to be correlated across the two equations. Combining the two equations, using the seemingly unrelated regression (SUR) method, is possible to obtain a more efficient estimator than a linear single equation. However, equation 2 should be estimated using the Maximum-likelihood (ML) estimation. Thus, our model was estimated equation-by-equation using the OLS and the ML methods and such estimates are still consistent (Herriges, 2011).

The definition and measurements of included variables are given in Table 1. Individual variables include the age, gender, education, main job and marital status of household heads. Household variables include the total number of household members, old and young members, and monthly household income. The objective characteristics of apartments consist of the number of bedrooms, bathrooms and balconies, size of apartments and type of apartments (social or cheap commercial apartments). The subjective characteristics of apartments are measured by respondents' subjective evaluations about the construction quality, architecture and price of their apartments. The quality of affordable apartments has raised main deep concerns among home buyers in Vietnam (Tuoitrenews, 2014). This suggests that poor quality is likely to be strongly linked with low housing satisfaction in the current study. While prices of affordable apartments have been much lower than those of high standard apartments, such prices have been too high for low and middle income households in Vietnam's big cities (WB, 2015). Thus, a household who evaluated that they purchased the apartment with reasonable price is expected to be more satisfied with their apartment. Finally, it is also expected that a positive evaluation of the design of apartments is positively related to overall housing satisfaction.

In the study context, the subjective evaluation of housing characteristics also includes

residents' opinion of the master plan and location of their apartment buildings (Le et al., 2016). As noted by Adriaanse (2007), this subjective evaluation provides important insights on which aspects of the setting have a greater effect on overall households' residential satisfaction. The location of the housing area with respect to work place and other facilities such as distances to town center, schools, hospitals, markets and public transportations are all factors that will affect residents' housing satisfaction (Mohit, Ibrahim, & Rashid, 2010). Residential satisfaction is also effected by the master plan of buildings, including outdoor public spaces of the buildings such as gardens, footpaths, playgrounds and other public facilities (Le et al., 2016). In addition, green spaces, environmental health or pollution, upkeep and cleanliness are also important neighborhood predictors in housing satisfaction (Rioux & Werner, 2011). This suggests that the environmental quality surrounding the housing area should be considered as a determinant of residential satisfaction.

In Vietnam, homebuyer credits are much of importance to purchasing affordable apartments (WB, 2015). Homebuyer credits might be positively associated with housing satisfaction possibly because they help home buyers purchase apartments today instead of saving enough money to pay for apartments later. Nevertheless, paying an interest rate to receive money to buy apartments today might put more financial pressures on home loan borrowers, which in turn might reduce their housing satisfaction. This suggests that the housing satisfaction effect of homebuyer credits might be ambiguous.

Table 1: Definition and measurement of variables

| Explanatory variables | Definition and measurement |
|---|---|
| Age | Age of respondent |
| Gender | Whether the respondent is male: 1= male; 0= female |
| <i>Education</i> | |
| Bachelor | Having a bachelor's degree: 1= yes; 0= otherwise |
| Master or higher | Having a master's degree or higher level: 1= yes; 0= otherwise |
| <i>Employment status</i> | |
| Sate owned enterprise (SOE) | Working for state owned enterprises: 1= yes; 0= otherwise |
| Privately owned enterprise (POE) | Working for privately owned enterprises: 1= yes; 0= otherwise |
| FDI enterprise | Working for foreign direct investment enterprises: 1= yes; 0= otherwise |
| Self-employment | Working as a self-employed earner: 1= yes; 0= otherwise |
| <i>Household characteristics</i> | |
| Young members | Total member of household members aged 14 and younger |
| Old members | Total member of household members aged 60 and older |
| <i>Economic status</i> | |
| Low income | Monthly average total household income (Million Vietnam Dong (VND) Less than 10 million VND: 1=yes; 0=otherwise |
| Middle income | From 10 million VND to 20 million VND: 1= yes; 0= otherwise |
| High income | More than 30 million VND: 1= yes; 0= otherwise |
| <i>Home loan</i> | |
| Formal loans | Borrowing from banks to buy the apartment: 1= yes; 0= otherwise |
| Informal loans | Borrowing from relatives or friends to buy the apartment: 1= yes; 0= otherwise |
| <i>Physical characteristics of apartments</i> | |
| Size | Total size of apartments in m ² |
| Rooms | Number of rooms |
| Bath rooms | Number of bath rooms |
| Balconies | Number of balconies |
| Type of apartment | 1=Social apartment; 0=Cheap commercial apartment |
| <i>Subjective characteristics of apartments</i> | |
| Price | Is the price of the apartment reasonable: 1= yes; 0= not |
| Architecture | Is the design of the apartment good: 1= yes; 0= not |
| Quality | Is the overall quality of the apartment good: 1= yes; 0= not |
| Location | Is the location of the building convenient for your work or family or social needs? 1= yes; 0= not |
| Master plan of the building | Is the master plan of the building good: 1= yes; 0= not |
| Environment | Is the environmental quality surrounding the housing area good: 1= yes; 0= not |
| District | Five dummy variables of district (Long Bien is the reference group) |

3. Results and discussion

3.1. Descriptive statistics

Table 2 presents the sample summary statistics about housing satisfaction. About half of all respondents reported being satisfied or very satisfied with their home while 31 % said that they were neither satisfied nor dissatisfied and 18 % being dissatisfied or very dissatisfied. A close look at the data by house type shows that while a higher proportion of respondents living in cheap commercial apartments (CCA) reported having a higher level of

housing satisfaction than those living in social apartments (SA), the percentages of respondents being neither satisfied nor dissatisfied with their apartment are quite similar between the two groups. In addition, the differences in dissatisfaction tend to be clear with 19 % of those living in SAs reporting to be dissatisfied with their apartment, compared with 13% of those living in CCAs. Finally, the mean of housing satisfaction is almost the same between the two groups. The Pearson Chi-square test shows that there is no association between the type of apartment and residential satisfaction.

Table 2: Distribution of residential satisfaction by house type (% of samples)

| <i>Housing satisfaction</i> | <i>All</i> | <i>Social apartments (SAs)</i> | <i>Cheap commercial apartments (CCAs)</i> |
|-----------------------------|------------|--------------------------------|---|
| Very satisfied | 7 | 8 | 6 |
| Satisfied | 44 | 38 | 46 |
| Neutral | 31 | 32 | 31 |
| Dissatisfied | 15 | 19 | 13 |
| Very dissatisfied | 3 | 3 | 3 |
| Mean | 3.37 | 3.30 | 3.40 |
| Observations | 449 | 150 | 299 |

Note: Pearson $\chi^2(4) = 4.2057$; P-value = 0.379.

Table 3 shows that 18% of surveyed respondents would not have chosen the same apartment if they were given the choice again. This means that a large majority of residents were quite happy with their choice. Looking at each subsample reveals that a higher share of residents (22 %) living in SAs would change their decision than that of those living in CCAs (16%). A higher proportion of respondents not choosing the same apartment was observed for the youngest group than for that of the oldest group. It is found that a higher percentage of male respondents would not buy the same apartment than that of female counterpart but this difference is not statistically significant. The data also indicate that a higher proportion of respondents with bachelor qualifications would not keep the choice among those living in SAs than that among those living in CCAs. The proportion of households borrowing from banks to buy home is also slightly higher for those with SAs than that for those with CCAs.

Table 3: Proportions of those respondents who would not choose the same apartment again

| Characteristics | All | Social apartments (SAs) | Cheap commercial apartments (CCAs) | p-value |
|----------------------------|------|-------------------------|------------------------------------|---------|
| <i>Age:</i> | | | | |
| Under 30 | 0.17 | 0.27 | 0.13 | ** |
| 30-40 | 0.20 | 0.15 | 0.27 | * |
| 40-50 | 0.18 | 0.12 | 0.21 | * |
| >50 | 0.14 | 0.10 | 0.15 | Non |
| <i>Gender</i> | | | | |
| Male | 0.20 | 0.25 | 0.18 | Non |
| Female | 0.16 | 0.19 | 0.14 | Non |
| <i>Education</i> | | | | |
| No bachelor | 0.02 | 0.00 | 0.04 | Non |
| Bachelor | 0.19 | 0.25 | 0.14 | ** |
| Master or higher | 0.27 | 0.27 | 0.27 | Non |
| <i>Employment sector</i> | | | | |
| Sate owned enterprise | 0.20 | 0.36 | 0.09 | *** |
| Privately owned enterprise | 0.18 | 0.20 | 0.16 | Non |
| FDI enterprise | 0.09 | 0.00 | 0.09 | Non |
| Self-employment | 0.18 | 0.09 | 0.22 | ** |
| Public sector | 0.20 | 0.16 | 0.18 | Non |
| <i>Economic status</i> | | | | |
| Low income | 0.24 | 0.23 | 0.26 | Non |
| Middle income | 0.18 | 0.21 | 0.17 | * |
| High income | 0.18 | 0.17 | 0.16 | Non |
| <i>Home loans</i> | | | | |
| Formal loans | 0.25 | 0.28 | 0.22 | * |
| Informal loans | 0.11 | 0.08 | 0.13 | Non |
| Non-borrowers | 0.16 | 0.16 | 0.16 | Non |
| All together | 0.18 | 0.22 | 0.16 | * |

Note: Non: not statistically significant, *, **, *** are statistically significant at 10%, 5% and 1%, respectively.

While there is a much lower of percentage of those working in FDI enterprise would not have chosen the same apartment (9%), the figure is much higher for those working in other sectors (18%-20%). However, looking at the sample of those living in SAs reveals that a very high proportion of respondents working in SOEs would change their choice than for those working in other sectors. A greater share of low income respondents would not remain the choice than that of middle and high income respondents. A quarter of respondents who borrowed from banks to buy home would not choose the same apartment. This figure is slightly higher for the those living in SAs and lower for those living in CCAs. 11% of respondents borrowing from relatives or friends to buy home and 18% of home loan non-borrowers would not have chosen the same apartment.

Table 4: Descriptive statistics of variables

| Explanatory variables | All | Social apartment | Cheap commercial apartment | |
|---|---------------|-------------------------|-----------------------------------|-----|
| Age | 37.20 (10.00) | 36.30 (8.46) | 37.60 (10.70) | Non |
| Gender | 0.50 | 0.54 | 0.48 | Non |
| <i>Education</i> | | | | |
| No bachelor | 0.12 | 0.09 | 0.18 | Non |
| Bachelor | 0.75 | 0.77 | 0.70 | Non |
| Master or higher | 0.13 | 0.14 | 0.12 | Non |
| <i>Employment status</i> | | | | |
| Sate owned enterprise | | | | * |
| | 0.13 | 0.16 | 0.12 | |
| Privately owned enterprise | 0.32 | 0.33 | 0.31 | Non |
| FDI enterprise | 0.05 | 0.03 | 0.06 | Non |
| Self-employment | 0.17 | 0.16 | 0.18 | Non |
| Public sector | 0.33 | 0.32 | 0.33 | Non |
| <i>Household characteristics</i> | | | | |
| Total members | 3.70 (1.00) | 3.70 (1.00) | 3.70 (1.00) | Non |
| Old members | 0.33 (0.64) | 0.22 (0.56) | 0.33 (0.68) | Non |
| Young members | 1.35 (0.77) | 1.41 (0.72) | 1.31 (0.78) | Non |
| <i>Economic status</i> | | | | |
| Low income | 0.09 | 0.15 | 0.07 | * |
| Middle income | 0.64 | 0.70 | 0.60 | * |
| High income | 0.27 | 0.15 | 0.33 | * |
| <i>Home loans</i> | | | | |
| Formal loans | 0.32 | 0.54 | 0.21 | ** |
| Informal loans | 0.16 | 0.09 | 0.20 | * |
| <i>Physical characteristics of apartments</i> | | | | |
| Size | 77.20 (20.30) | 65.30 (15.33) | 83.15 (20.00) | * |
| Rooms | 2.25 (0.51) | 2.01 (0.50) | 2.34 (0.50) | Non |
| Bath rooms | 1.82 (0.42) | 1.62 (0.49) | 1.92 (0.33) | Non |
| Balconies | 1.23 (0.45) | 1.30 (0.46) | 1.24 (0.44) | Non |
| <i>Subjective evaluation of apartments</i> | | | | |
| Price | 0.45 | 0.50 | 0.43 | Non |
| Design | 0.43 | 0.45 | 0.42 | Non |
| Quality | 0.39 | 0.41 | 0.38 | Non |
| Location | 0.37 | 0.36 | 0.38 | Non |
| Master plan of the building | 0.22 | 0.22 | 0.23 | Non |
| Environment | 0.50 | 0.52 | 0.49 | Non |

Note: Non: not statistically significant, *, **, *** are statistically significant at 10%, 5% and 1%, respectively.

Table 4 reports descriptive statistics from the survey data. On average, the age of respondents is 37 years and this figure is almost the same between those living in SAs and those living in CCAs. The proportion of male and female respondents are equally and this figure is slightly higher for those living in SAs. Generally, most respondents had higher education qualifications. 75 % of respondents attained master degrees and the figure is higher

for those living in SA (77%) than for those living in CCAs (70%) but the difference is not statistically significant. The share of respondents working for the public sector (PC) is almost equal to that for privately owned enterprises (POEs). This similarity is also observed among those living in SA and CCAs. 17% of respondents worked as self-employed earners and the figure is negligibly lower for those residing in SAs. 13 % of respondents worked for state owned enterprises (SOEs) and only 5% of respondents worked for foreign direct investment enterprises (FDIEs). The share of respondents working for SOEs is higher for those living in SAs (16%) than for those living in CCAs (12%) and this difference is statistically significant at the 0.05 level.

The average household size is 3.7 for the whole sample as well as for each sub-sample. The average number of old and young members is also quite similar between those living in SAs and those living in CCAs. However, there is some difference in economic status between the two groups. The data show that 9%, 64% and 27% of the surveyed households are categorized as low, middle and high income groups, respectively. The test shows that the share of low and middle income households seems to be higher among those living in SAs, while the share of high income households is higher for those residing in CCAs. As shown in Table 3, 32 % and 16 % of surveyed households borrowed formal and informal loans to buy apartments, respectively. However, a substantially higher proportion of households living in SAs borrowed from bank to buy apartments (54%), while the corresponding figure for those living in CCAs is 21% only. By contrast, the share of households borrowing from relatives or friends to buy apartments is higher for those living in CCAs (21% vs 9%).

Regarding the physical characteristics of apartments, the data indicate that the average size of apartments is about 77 m². However, the average size of SAs is bigger than that of CCAs. The average number of rooms, bath rooms and balconies are quite similar between the

two type of apartments. The test indicates that suggests that there is no statistically significant difference in evaluation of housing attributes between the two groups.

Table 5: Comparison between the two income groups

| Explanatory variables | All | Low and middle income | High income | p-value |
|---|---------------|------------------------------|--------------------|----------------|
| Age | 37.20 (10.00) | 37.27 (10.50) | 36.90 (8.70) | Non |
| Gender | 0.50 | 0.50 | 0.52 | Non |
| <i>Education</i> | | | | |
| No bachelor | 0.12 | 0.07 | 0.11 | ** |
| Bachelor | 0.75 | 0.74 | 0.76 | Non |
| Master or higher | 0.13 | 0.13 | 0.15 | Non |
| <i>Employment status</i> | | | | |
| Sate owned enterprise | | | | Non |
| Privately owned enterprise | 0.13 | 0.13 | 0.14 | |
| FDI enterprise | 0.32 | 0.30 | 0.34 | Non |
| Self-employment | 0.05 | 0.05 | 0.05 | Non |
| Public sector | 0.17 | 0.15 | 0.24 | ** |
| | 0.33 | 0.35 | 0.23 | ** |
| <i>Household characteristics</i> | | | | |
| Total members | 3.70 (1.00) | 3.70 (1.05) | 3.70 (0.94) | Non |
| Old members | 0.33 (0.64) | 0.32 (0.67) | 0.22(0.54) | Non |
| Young members | 1.35 (0.77) | 1.34 (0.77) | 1.36 (0.80) | Non |
| <i>Home loans</i> | | | | |
| Formal loans | 0.32 | 0.35 | 0.25 | * |
| Informal loans | 0.16 | 0.16 | 0.15 | Non |
| <i>Physical characteristics of apartments</i> | | | | |
| Size | 77.20 (20.30) | 75.20 (20.17) | 82.10 (20.00) | *** |
| Rooms | 2.25 (0.51) | 2.10 (0.50) | 2.30 (0.53) | * |
| Bath rooms | 1.82 (0.42) | 1.80 (0.40) | 1.85 (0.37) | Non |
| Balconies | 1.23 (0.45) | 1.25 (0.44) | 1.30 (0.37) | Non |
| <i>Subjective evaluation of apartments</i> | | | | |
| Price | 0.45 | 0.44 | 0.48 | Non |
| Design | 0.43 | 0.43 | 0.42 | Non |
| Quality | 0.39 | 0.41 | 0.35 | Non |
| Location | 0.37 | 0.36 | 0.40 | Non |
| Master plan of the building | 0.22 | 0.21 | 0.25 | Non |
| Environment | 0.50 | 0.50 | 0.48 | Non |
| Observations | 449 | 327 | 122 | |

Note: Non: not statistically significant, *, **, *** are statistically significant at 10%, 5% and 1%, respectively.

Table 5 examines the differences in mean values of the two income groups. As shown in this table, the share of residents without a bachelor degree is somewhat higher for high income residents. The proportion of residents working as self-employed is higher for the high-income group than that for the low and middle income group. However, the data show that the percentage of residents working for the public sector is higher among the low and middle income group. A higher share of residents borrowing from banks to buy home was also found

for low and middle income residents. Finally, on average, rich residents have a house with a larger size than that of low and middle income residents.

3.2. Economic results

The study sample includes two subsamples, one for respondents living in social apartments and one for respondents living in affordable commercial apartments, which suggests that residents' behaviors in response to housing might be different. Hence, we used a Chow test to assess whether pooling the two subsamples or whether separate models should be run for (Greene, 1997). The result from the Chow test confirms that running a single regression using both subsamples should be an appropriate option (Dougherty, 2007) for all models in Table 6³. Because housing attributes are likely to be highly correlated with individual and household characteristics, we performed a test to detect the issue of multicollinearity. The result shows that values of VIF (variance inflation factor) are smaller than 4.13 in all models, indicating that our models do not suffer from serious multicollinearity (Wooldridge, 2013). Finally, we use option "robust" in STATA to obtain White-corrected standard errors in the presence of heteroskedasticity.

Table 6 presents factors associated with residential satisfaction. We run different models using different sets of explanatory variables. When household characteristics were added in Model 2, the R-squared slightly increased and more other variables became statistically significant. However, when respondents' subjective assessments of their housing were included in Model 5, the explained variance for housing satisfaction increased greatly, from about 0.10 to 0.556 while remaining the statistical significance of other variables. Thus, Model 5 (the full model) appears to provide the best result. As evident in this model, the age

³ We could not apply the same test for models in Table 7 because those models are estimated by maximum likelihood methods. Therefore, we apply the Chow test for Models in Table 7 using the OLS estimator and the results confirm that pooling the two subsamples should be preferred.

and gender of respondents have no impact on residential satisfaction. However, the results show that respondents with a bachelor's degree or higher tend to be less satisfied with their apartments than those without a bachelor's degree. This might be explained that those with higher education qualification tend to have higher standards and aspirations, which might lead them to be less satisfied with their home. The study also reveals that respondents working for FDI enterprises tend to be more satisfied with their home than those working for the public sector. The results indicate that, holding all other being equal, residents living in SAs had a slightly lower level of housing satisfaction (0.15 points) than those living in CCAs.

Table 6: Factors associated with housing satisfaction

| VARIABLES | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---------------------|-------------|---------|-------------|---------|-------------|---------|-------------|---------|
| | Coefficient | SE | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| Age | 0.01 | (0.005) | 0.00 | (0.005) | 0.00 | (0.005) | -0.01 | (0.004) |
| Gender | -0.04 | (0.087) | -0.04 | (0.089) | -0.02 | (0.091) | 0.06 | (0.065) |
| Bachelor | -0.54*** | (0.114) | -0.56*** | (0.116) | -0.54*** | (0.116) | -0.36*** | (0.092) |
| Master or higher | -0.79*** | (0.173) | -0.82*** | (0.174) | -0.77*** | (0.173) | -0.53** | (0.126) |
| SOEs | 0.02 | (0.143) | 0.02 | (0.145) | 0.05 | (0.145) | -0.04 | (0.105) |
| POEs | 0.08 | (0.113) | 0.08 | (0.113) | 0.04 | (0.116) | -0.05 | (0.084) |
| FDI | 0.42** | (0.202) | 0.42** | (0.209) | 0.44** | (0.216) | 0.31** | (0.164) |
| Self-employed | -0.04 | (0.136) | -0.06 | (0.137) | -0.06 | (0.138) | -0.02 | (0.104) |
| Household size | | | 0.08 | (0.065) | 0.11 | (0.070) | 0.06 | (0.054) |
| Older members | | | 0.02 | (0.086) | 0.03 | (0.089) | 0.05 | (0.066) |
| Young members | | | -0.07 | (0.074) | -0.10 | (0.077) | -0.05 | (0.060) |
| Middle income | | | 0.26* | (0.157) | 0.30* | (0.163) | 0.22** | (0.117) |
| High income | | | 0.29* | (0.167) | 0.32* | (0.175) | 0.25*** | (0.126) |
| Formal loan | | | -0.21* | (0.105) | -0.23** | (0.113) | -0.20** | (0.077) |
| Informal loan | | | 0.01 | (0.112) | -0.01 | (0.115) | 0.05 | (0.091) |
| Size | | | | | -0.00 | (0.005) | 0.00 | (0.003) |
| Rooms | | | | | -0.03 | (0.158) | -0.09 | (0.111) |
| Balconies | | | | | 0.16 | (0.116) | 0.05 | (0.086) |
| Bath rooms | | | | | -0.16 | (0.137) | -0.11 | (0.100) |
| Type of house | | | | | -0.12 | (0.111) | -0.15* | (0.084) |
| Price | | | | | | | 0.45*** | (0.065) |
| Location | | | | | | | 0.65*** | (0.073) |
| Design | | | | | | | 0.34*** | (0.067) |
| Quality | | | | | | | 0.36*** | (0.065) |
| Master plan | | | | | | | 0.13*** | (0.078) |
| Environment | | | | | | | 0.51*** | (0.073) |
| Hoang Mai | | | | | | | -0.02 | (0.117) |
| Thanh Xuan | | | | | | | 0.33*** | (0.120) |
| North Tu Liem | | | | | | | 0.08 | (0.118) |
| South Tu Liem | | | | | | | 0.10 | (0.150) |
| Ha Dong | | | | | | | 0.14 | (0.117) |
| Constant | 3.60*** | (0.241) | 3.40*** | (0.314) | 3.69*** | (0.391) | 2.88*** | (0.314) |
| Observations | | 444 | | 442 | | 434 | | 434 |
| R-squared | | 0.069 | | 0.091 | | 0.103 | | 0.556 |
| Chow test (p-value) | | 0.356 | | 0.918 | | 0.999 | | 0.495 |

Note White-corrected standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Long Bien is the reference district.

Table 7: Odds ratios for choosing the same apartment again

| VARIABLES | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|------------------|------------|----------|------------|----------|------------|-----------|------------|-----------|
| | Odds ratio | SE | Odds ratio | SE | Odds ratio | SE | Odds ratio | SE |
| Age | 1.01 | (0.013) | 1.00 | (0.014) | 0.99 | (0.014) | 0.98 | (0.016) |
| Gender | 0.71 | (0.180) | 0.68 | (0.177) | 0.72 | (0.189) | 0.71 | (0.223) |
| Bachelor | 0.08** | (0.080) | 0.07** | (0.074) | 0.06** | (0.068) | 0.08* | (0.117) |
| Master or higher | 0.05*** | (0.053) | 0.04*** | (0.046) | 0.04*** | (0.046) | 0.04** | (0.062) |
| SOEs | 0.86 | (0.346) | 0.88 | (0.379) | 0.80 | (0.351) | 0.58 | (0.324) |
| POEs | 0.99 | (0.325) | 0.97 | (0.323) | 0.90 | (0.313) | 0.48* | (0.197) |
| FDI | 2.25 | (1.732) | 2.14 | (1.733) | 1.99 | (1.632) | 1.10 | (0.772) |
| Self-employed | 0.73 | (0.290) | 0.71 | (0.295) | 0.65 | (0.274) | 0.48 | (0.260) |
| Household size | | | 1.13 | (0.236) | 1.27 | (0.300) | 1.08 | (0.319) |
| Older members | | | 0.93 | (0.229) | 0.93 | (0.246) | 0.95 | (0.328) |
| Young members | | | 0.84 | (0.221) | 0.76 | (0.223) | 0.91 | (0.325) |
| Middle income | | | 2.10* | (0.894) | 2.76** | (1.276) | 4.40** | (2.254) |
| High income | | | 2.24* | (1.047) | 2.62** | (1.286) | 3.58* | (2.284) |
| Formal loan | | | 0.54** | (0.155) | 0.51** | (0.166) | 0.39*** | (0.155) |
| Informal loan | | | 1.61 | (0.738) | 1.51 | (0.714) | 1.59 | (0.956) |
| Size | | | | | 1.02 | (0.014) | 1.02** | (0.018) |
| Rooms | | | | | 0.45* | (0.208) | 0.26** | (0.157) |
| Balconies | | | | | 0.91 | (0.288) | 0.71 | (0.341) |
| Bath rooms | | | | | 0.58 | (0.238) | 0.51 | (0.247) |
| Type of house | | | | | 0.82 | (0.266) | 0.53 | (0.304) |
| Price | | | | | | | 14.30*** | (7.964) |
| Location | | | | | | | 4.84*** | (2.551) |
| Design | | | | | | | 2.40** | (0.913) |
| Quality | | | | | | | 5.95*** | (2.347) |
| Master plan | | | | | | | 1.38 | (0.700) |
| Environment | | | | | | | 6.53*** | (2.730) |
| Hoang Mai | | | | | | | 1.03 | (0.550) |
| Thanh Xuan | | | | | | | 4.10*** | (1.998) |
| North Tu Liem | | | | | | | 3.72** | (2.173) |
| South Tu Liem | | | | | | | 5.86*** | (3.976) |
| Ha Dong | | | | | | | 4.63 | (4.118) |
| Constant | 52.30*** | (68.440) | 39.58** | (57.386) | 207.70*** | (344.930) | 56.40* | (118.552) |
| Pseudo R2 | | 0.05 | | 0.08 | | 0.10 | | 0.416 |
| Observations | | 444 | | 442 | | 434 | | 434 |

Note: White-corrected standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In line with previous studies (Diaz-Serrano, 2009; Hu, 2013), our study finds that household income is an important determinant of residential satisfaction. Holding all other variables constant, respondents that belong to high income and middle income households would have housing satisfaction scores that were 0.22 points and 0.25 points higher than those of respondents in low income households, respectively. This might be explained that high income households are more likely to be satisfied with their houses because they have the financial means to possess a better home (Lee & Park, 2010). Interestingly, we find that respondents with housing bank loans tend to report themselves to be less satisfied with their home than non-borrowing counterparts. Specifically, home loan borrowers tend to have residential satisfaction scores that were 0.20 points lower than their counterparts, keeping all other factors constant. This might stem from the fact that the monthly estimated payment for the principal and interest might put more financial pressures on home loan borrowers which makes them less satisfied with their home.

The current study finds that the size, number of bedrooms, bathrooms and balconies have no impact on housing satisfaction. However, we find a strong and positive association between residents' subjective evaluation of their apartment and their overall residential satisfaction. The results show that holding all other variables constant, residents who were satisfied with the location of housing area tend to have housing satisfaction scores being 0.65 points higher than those being dissatisfied with the location of housing area. Similar findings were also observed for the positive evaluation of the price, design and quality of apartments as well as of the master plan of the building and the quality of environment surrounding the housing area. In general, the finding is consistent with many studies (Adriaanse, 2007; Baiden et al., 2011; Balestra & Sultan, 2013; Le et al., 2016; Rioux & Werner, 2011) which found that subjective characteristics of houses and neighborhoods are the most important

factors affecting residential satisfaction. The results also indicate that controlling for other factors, residents living in Thanh Xuan tend to be more satisfied with housing than those living in Long Bien District.

Table 7 presents the estimation results with odd ratios from the Logistic Model, with different set of explanatory variables. The estimation results from Model 6 show that many explanatory variables are statistically significant at the 10 percent or lower level, with their signs as expected. Also, the Pseudo-R² =0.416 and is highly significant, indicating that this model has a strong explanatory power⁴. It is evident that both models of housing satisfaction and choosing the same apartment again have a similar pattern in terms of the contribution of subjective housing characteristics to the explained variance of the models. It should be noted that Table 6 reports *odd ratios for those who would choose the same apartments if they were given the choice again*. The logistic model test also identified variables that were significant predictors of choosing the same apartment again. The result shows that given the choice again, respondents with better education are less likely to buy the same apartment. Respondents with middle and high income are more likely to buy the same apartments than those with low income, with the odd ratios are 4.40 times and 3.60 times, respectively. Home loan borrowers are also less likely to buy the same apartment (odd ratio: 0.40 times) than home loan non-borrowers. Residents' subjective assessments of their housing have substantial effects on buying the same apartments again. Among other factors, satisfaction with apartment prices appears to have the most substantial impact on buying the same apartments. The odd of buying the same apartments are 14.30 times as high for respondents with price satisfaction as for those with price dissatisfaction. Respondents' positive evaluation of quality, location and environment is strongly associated with their choice of

⁴ An extremely good fit of the model is confirmed if the value of the Pseudo-R² ranges from 0.2 to 0.4 (Louviere, Hensher, & Swait, 2000; Scarpa et al., 2003a).

the same apartment again. Finally, residents living in Thanh Xuan, North and South Tu Liem, are more likely to choose the same apartments again than those living in Long Bien.

4. Conclusion and policy implication

The purpose of the current study was to examine the level of housing satisfaction and its determinants among residents who live in affordable apartments in sampled urban districts of Hanoi, Vietnam. The study find that about half of respondents were satisfied or very satisfied with their residences; about 30% were neither satisfied nor dissatisfied while nearly 20% were dissatisfied or very dissatisfied with their housing. The study also find that the level of housing satisfaction was not different between residents living in social apartments and those living in cheap commercial apartments. In addition, we find that 18% of residents said that they would have not chosen the same apartment if they were given the choice again. This means that a large part of the residents was quite happy with their choice. However, we find that the proportion of respondents who would not choose the same apartment again are slightly higher among those with social apartments than those with cheap commercial apartments.

Using regression analysis, this study identified variables that were significant predictors of residents' housing satisfaction. Residential satisfaction was found to be positively associated with household income but negatively related to educational levels. As previously discussed, the positive association between household income and housing satisfaction might be explained as Lee and Park (2010) that households with higher income have more financial resources to buy better houses or facilitate better furnishing and decoration. Nevertheless, the negative link between education and housing satisfaction might reflex the fact that better educated respondents tend to have higher standards and aspirations which make them less satisfied with their residences. Interestingly, the study finds that

residents who borrowed from banks to buy apartments tend to be less satisfied with their home than their non-borrowing counterparts. Possibly, suffering the financial burden of bank loans make home loan buyers less satisfied with their home.

In line with previous studies, we find that subjective characteristics of apartments which measure housing quality were the most influential factors on housing satisfaction. As noted by (Vliet, 1992), the objective characteristics of housing quality are reflexed in the subjective assessment of residents and these conditions can reflex the comforts experienced by residents (Elsinga & Hoekstra, 2005). Among other factors, the construction quality and design of apartments, the location, master plan of apartment buildings and the environment surrounding the housing area, were found to be important factors associated with residential housing. Especially, in the study context, it was found that that satisfaction with the price of apartments is also a crucial predictor of housing satisfaction.

The findings of the study provide some useful implications for both planners and housing developers. While a large majority of respondents (82%) would have choose the same apartment if they were given the choice gain, there is still nearly 20% expressed their dissatisfaction with their home. This suggests that more practical measures should be applied to improve housing satisfaction for those living in affordable apartments. Specifically, the findings indicate that the affordable prices, good construction quality and good design of apartments should be considered to enhance residential satisfaction. The findings on the role of prime location and environmental quality also suggest affordable apartment projects should be developed in relatively convenient locations with clean environment. Unfortunately, such policy implications raise some challenging questions. Having a prime location with clean environment often requires huge investments in socio-economic

infrastructure (e.g., road, schools), while such investments might bring low returns in the short-term for housing developers. Thus, land prices in relatively prime locations with clean environment are often quite high to make a project affordable for low and middle income households. A possible policy implication here is that the government should support the development of affordable housing market by investing in socio-economic infrastructures or put forward more incentives and preferential policies to encourage developers who invests in less convenient locations.

Appendix

Ordered logit estimations for housing satisfaction

| VARIABLES | Odd ratio | SE |
|------------------|-----------|----------|
| Age | 0.99 | (0.012) |
| Gender | 0.87 | (0.180) |
| Bachelor | 0.45** | (0.154) |
| Master or higher | 0.27*** | (0.119) |
| SOEs | 0.96 | (0.298) |
| POEs | 0.82 | (0.206) |
| FDI | 1.79 | (0.989) |
| Self-employed | 1.16 | (0.399) |
| Household size | 1.28 | (0.216) |
| Older members | 1.00 | (0.202) |
| Young members | 0.72* | (0.140) |
| Middle income | 2.16** | (0.727) |
| High income | 2.54** | (0.967) |
| Formal loan | 0.55** | (0.129) |
| Informal loan | 0.95 | (0.266) |
| Size | 1.00 | (0.010) |
| Rooms | 0.62 | (0.228) |
| Balconies | 1.28 | (0.344) |
| Bath rooms | 0.93 | (0.287) |
| Type of house | 0.62* | (0.168) |
| Price | 3.37*** | (0.714) |
| Location | 6.51*** | (1.831) |
| Design | 2.87*** | (0.625) |
| Quality | 2.93*** | (0.632) |
| Master plan | 1.72** | (0.475) |
| Environment | 4.10*** | (0.981) |
| Hoang Mai | 0.86 | (0.312) |
| Thanh Xuan | 2.42** | (0.933) |
| North Tu Liem | 0.76 | (0.266) |
| South Tu Liem | 1.18 | (0.378) |
| Ha Dong | 1.95* | (0.735) |
| cut1 | | |
| Constant | 0.08** | (0.084) |
| cut2 | | |
| Constant | 0.89 | (0.923) |
| cut3 | | |
| Constant | 10.87** | (11.414) |

| | | |
|--------------|-----------|-----------|
| cut4 | | |
| Constant | 591.25*** | (644.773) |
| Observations | 434 | |

Note White-corrected standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Long Bien is the reference district.

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