

Residential Zones of Students around a University in Ho Chi Minh City: Characteristics and Preferences

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ABSTRACT

The student housing market has had free and unsystematic development in developing cities with a high density of universities. In Ho Chi Minh City, the situation has resulted in specific negative urban issues and low life quality for students. This study aimed to clarify how students allocate around a university, the residential zones' characteristics, and preferences for the residential zones. We analyzed survey data of 304 students at a university in Ho Chi Minh City. We addressed the differences among residential zones through statistical analyses of group differences. A multinomial logit model was deployed to explore students' choice of residential zones. Results show significant characteristics that affected the students' choice, including academic levels, motorcycle usage, employment status, family income, household member, household size, and gender. Some implications for policymaking in the student housing market were raised regarding residential zones, integrating transport systems, travel behavior, and employment opportunities. The study enhanced knowledge of the student housing situation (i.e., residential zones or residential allocation) and the student's preferences. Policymakers and practitioners developing student housing markets, built environments, and related services can benefit from this study. The findings apply to the specific city under investigation and are useful to other Southeast Asian cities with similar socio-cultural contexts.

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1. Introduction

University cities with many students moving to for studying have become popular in many countries. In the cities, the urban environment has a social integration of student housing, considering its locations. Moreover, studentification in neighborhoods or student housing can drive urban change (Kinton et al., 2018; Prada, 2019). Generally, the students' residential choice has specific characteristics for many reasons. First, students' location is temporary, relating to their studying period. Second, the group is primarily young, single, and independent. They can participate in many social and cultural

activities. Third, students' residential choice might impact their studying life, including academic performance (Adama, et al., 2018). The increase in student housing near campuses has had added economic, cultural, and social impacts on urban areas (Gregory, 2020; Gu and Smith, 2020).

In literature, the residential locations have been considered a characteristic that impacts the students' residential choice rather than a choice. Thomsen and Eikemo (2010) impressed three critical aspects for student housing satisfaction, including housing type characteristics and location, while demographic factors and facilities were insignificant. In developing countries,

distance to campus, renting price, housing type (Kolawole and Boluwatife, 2016), age, and academic level (Adama et al., 2018) were found to be related to residential students' choices. Modest studies seek factors affecting location choice, including explorations by Krishnapriya and George (2020) and Ralph and Brown (2019) that showed a relationship between students' travel behaviors and residential location. Frenkel, Bendit, and Kaplan (2013) presented the impacts of the built environment on location choices besides housing price and commuting time. Additionally, McBride (2017) found that the number of students interested in on-campus living will be reduced in the future as a trend. Moreover, campuses will be transformed (Susanti et al., 2020).

The student housing market has been developed with high-standard flats in developed countries (Verhetsel et al., 2017) as a submarket specific to age segregation (Revington, 2021). Franz and Gruber (2022) impressed student housing as a social infrastructure. However, the function has been overlooked under the influence of private providers. Student housing is a pressing planning issue with changes for studentification and amenities (Revington et al., 2020). The phenomenon of student housing from private providers is similar in developing countries. There is a minimal capacity for dormitories and substantial investment opportunities in the student housing market. However, the market has been noticed modestly (Sulaiman et al., 2018). Moreover, private student housing has

been developed free and unsystematically. Many student-rented houses are converted from family houses (Baba Hammad et al., 2013; Donaldson et al., 2014), including apartments, condominiums, and semi-detached or detached houses. Some studies reported that the student housing market is resilient and promising (Garg et al., 2014; Sulaiman et al., 2018). Figure 1 summarizes the relationship between the student's residential choice and relevant factors shown in the literature.

This study uses Ho Chi Minh City (HCMC) as a case study. The city is a high-density city with a population of 9.2 million people, and the population density in urban districts was around 20 thousand persons per square kilometer (Ho Chi Minh City Statistics Office, 2022). The city has the most universities and institutes in South Vietnam, providing an educational program for almost 600 thousand students (General Statistics Office, 2022). Many students in HCMC are from nearby provinces and must seek accommodation for their studying life. The striking demand pressures the housing market in the city. Research on the student housing market is modest in this area. A previous investigation showed the low quality of student housing and students' dissatisfaction with their accommodation (Pham and Nguyen, 2021). Additionally, location has been demonstrated as an essential factor in the students' residential choice (Vi et al., 2020; Pham and Nguyen, 2021).

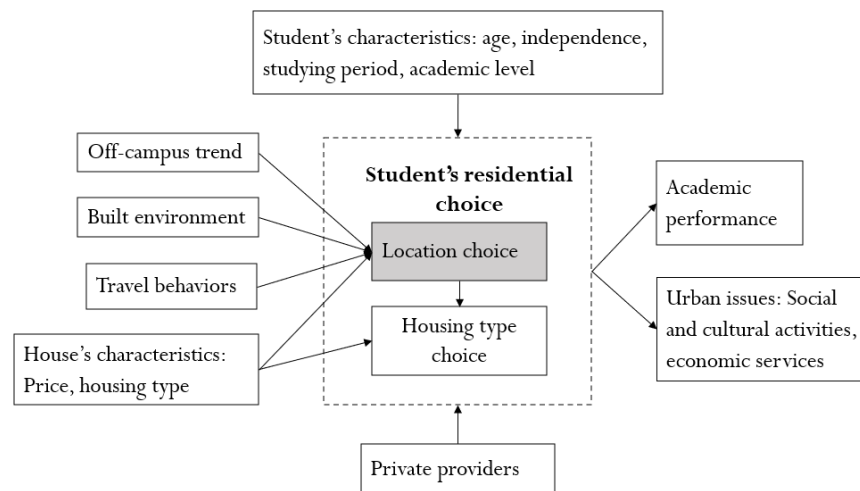


Figure 1 Student's residential choice and relevant factors

Because of the increasing demand for off-campus student housing and its potential urban issues, the students' residential location needs to be investigated for further public and professional discussions in meeting student housing demand and its social integration in the urban environment. To our knowledge, no previous studies about students' residential location zones around a university exist. Drawing from the existing literature on residential choice (refer to Figure 1), we concern with factors of the built environment (i.e., open space, bus system, industrial park, etc.), travel behaviors (i.e., transport mode usage), house characteristics (i.e., type, area,

cost, etc.), and student's characteristics (i.e., age, gender, household size, etc.). Also, we introduce the role of the student's part-time job (i.e., the job status, workplace, travel time and travel cost to the place, etc.) to the location zone choice. Taking Ho Chi Minh City context, this study addresses the differences among residential zones and significant individual characteristics impacting students' preferences. The results are expected to be helpful for policymakers to examine built environment and social-economic segregations for residential zone allocation toward a harmonious and quality student housing market.

2. Methodology

2.1 Questionnaire and Survey Design

We designed a questionnaire to collect information about the residential zone choice of students at the Industrial University of Ho Chi Minh City (IUH). Students are asked to show their location and relevant information, including distance from home to university, housing type, ownership status, area, household size, payment fee, built environment characteristics in the location (i.e., open market or supermarket, park or green space, bus system, plants, or industrial park), distance from home to their workplace (if any), residential time, and residential changes. Students were also asked about their part-time job, vehicle usage to the university, and workplace (if any). Finally, students' social characteristics were addressed with information about the school year, the number of days they go to the university, their income, family income, whom they live with, and gender. The questionnaire was pre-tested with a sample of 20 students. The students were asked to read and note which details were difficult to understand. The questionnaire was then checked and revised based on their notes.

We used the revised questionnaire in a survey with an expected sample of 300 as a requirement for unbiased parameter estimation for a multinomial logit model with covariates are normal, positively skewed, or categorical, as suggested by Hamid et al (2016) and Hamid et al (2020). We applied a face-to-face survey with trained interviewees and an online survey using the Kobo toolbox to speed up the data collection. The survey was conducted between March and May 2023.

2.2 Data Analysis

We addressed the characteristics of residential location zones using the Kruskal-Wallis test to identify if there is any difference in the characteristics across the zones. For binomial characteristics, we used the Chi-squared test to examine differences in proportions among zones. Additionally, we used the Wilcoxon rank sum test to examine differences in travel time and travel cost between motorcycles and buses in residential zones.

Regarding the influence of individual characteristics on the residential zone choice, we deployed a multinomial logit model. According to the theory of Random Utility Maximization, an alternative with the highest utility will be chosen in a choice set (Train, 1986). The multinomial logit model is deployed to address the utility term of individual i (Equation 1) for his or her

decision on choosing a residential zone Z in the choice set $z = \{1, \dots, M\}$. The probability that a residential zone Z is chosen can be written as Equation 2.

$$u_{iz} = \alpha x_z + \beta_z y_i + \varepsilon_{iz} \quad (1)$$

$$\Pr(Z_i = z) = \frac{e^{\alpha x_z + \beta_z y_i}}{e^{\alpha x_z + \beta_z y_i} + \sum_{t_m \neq t} e^{\alpha x_{z_m} + \beta_{z_m} y_i}} \quad (2)$$

where u_{iz} is the utility function of student i when choosing a residential zone z , x_z is a variable that represents characteristics of alternative z , y_i is a variable that represents characteristics of student i , α and β_z are the parameters of variables x_z and y_i , and ε_{iz} is the error term. R language and environment (R Core Team, 2023) was used to estimate the parameter by maximizing the model's log-likelihood.

3. Data

A dataset of 304 students who are studying at IUH was obtained. Respondents are first-year students (31%), second-year students (20%), third-year students (27%), and fourth-year students or more (21%). The description of the sample is in Table 1. Students must go to the university four days a week on average. They have an average household size of four and used to change their home once. In Vietnam, students have subsidized from their families rather than government loans to pay living costs, including the budget for housing. Therefore, their family income might impact the students' choices. The data shows students' monthly family income is from 20 to 25 million VND. Besides, many students (33%) have part-time jobs and mainly have a monthly income lower than 6 million VND. Most students drive motorcycles daily to university and workplaces (if any) instead of a bus. That might be because of the city's poor bus system and heavy traffic congestion (Nguyen et al., 2020).

Additionally, most students (65 %) live with their friends (i.e., hometown friends and other students). The others live with family (18%), relatives (12%), or alone (3%). Regarding housing types, most students (39.8%) live in peer-shared houses with private toilets and kitchens and not in the same house with the landlord (Type 6). 19.41% live in tube houses (Type 3). The number of students living in dormitories (Type 1) occupies the smallest ratio of 7.89% (Figure 2).

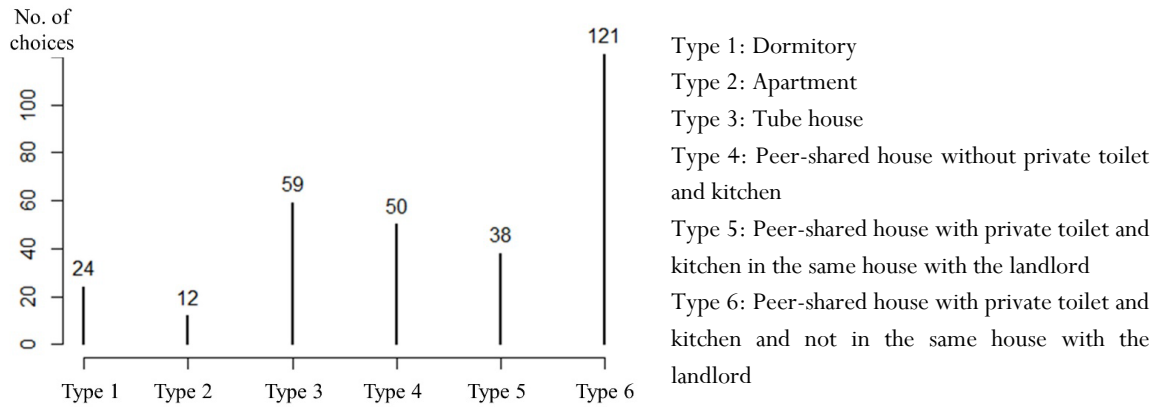


Figure 2 Housing types

Table 1 Demographic and residential description (N = 304)

Characteristics	Min	Max	Median	Mean	SD.
Gender: male = 1, female = 2	1	2	2	1.54	0.5
Education level: 1 (first year), 2 (second year), 3 (third year), 4 (fourth year or more)	1	4	2	2.38	1.13
Number of days at university (day/week)	0	7	4	3.79	1.44
Household size (persons)	1	16	4	4.12	2.47
Residential characteristic: 1 (first place), 2 (second place), 3 (third place or more)	1	3	2	1.75	0.66
Take a part-time job: 1 (yes), 2 (no)	1	2	2	1.67	0.47
Individual income (10 ⁶ VND/month): 1 (<3), 2 (3–4), 3 (4–5), 4 (5–6), 5 (6–7), 6 (7–8), 7 (8–10), 8 (10–15), 9 (15–20), 10 (>20)	1	10	3	3.45	2.22
Household income (10 ⁶ VND/month): 1 (<5), 2 (5–10), 3 (10–15), 4 (15–20), 5 (20–25), 6 (25–30), 7 (30–40), 8 (40–50), 9 (50–70), 10 (>70)	1	10	5	5.08	1.99
Frequency of bus use to university: 1 (never), 2 (less than once per month), 3 (less than once per week), 4 (1-2 times a week), 5 (3-4 times a week), 6 (almost daily)	1	6	1	2.22	1.51
Frequency of motorbike use to university: 1 (never), 2 (less than once per month), 3 (less than once per week), 4 (1-2 times a week), 5 (3-4 times a week), 6 (almost daily)	1	6	5	4.93	1.38
Frequency of bus use to workplace: 1 (never), 2 (less than once per month), 3 (less than once per week), 4 (1-2 times a week), 5 (3-4 times a week), 6 (almost daily)	1	6	1	1.56	1.12
Frequency of motorbike use to the workplace: 1 (never), 2 (less than once per month), 3 (less than once per week), 4 (1-2 times a week), 5 (3-4 times a week), 6 (almost daily)	1	6	6	5.27	1.53

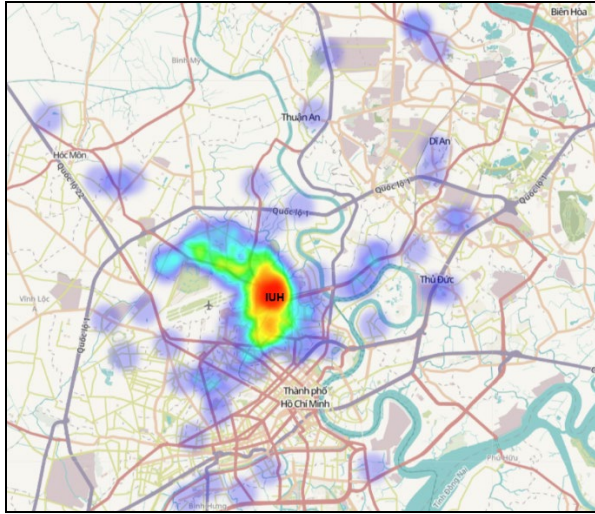


Figure 3 The density of student residence

Figure 3 shows that students tend to live near the campus. Based on the distribution of distance from home to university (Figure 4), the residential zones were classified into four zones. Zone 1 covers residential locations with distances lower than 3 km, Zone 2 covers residential locations with distances from 3 to 6

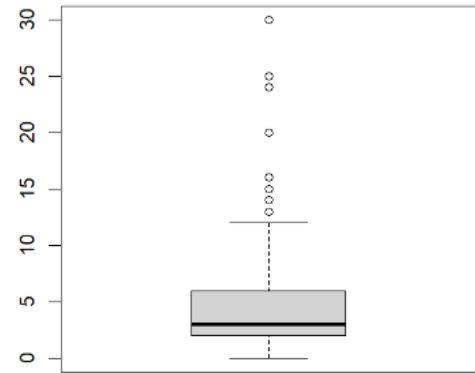


Figure 4 Distance from home to the university

km, Zone 3 covers residential locations with distances from 6 to 10 km, and Zone 4 covers students with distances from 10 km. Table 2 describes the distributions of zones. The zones were used for further analysis of zones' characteristics and students' choices.

Table 2 location zones of students (N = 304)

	Zones			
	Zone 1	Zone 2	Zone 3	Zone 4
Range from IUH	< 3km	3 – 6 km	6 – 10 km	> 10 km
Number of students	124	85	50	45

4. Results and discussion

4.1 Characteristics of Residential Location Zones

Table 3 presents differences relating to the built environment among zones. Besides the difference in distance from home to university, we found significant differences in distance from home to workplace, home ownership, residential area, residential cost, distances to a bus stop from home and workplace, number of bus transfers to the university, travel time and travel cost to the university by either bus or motorbike, travel time and travel cost to the workplace by motorbike, and some other built environment characteristics including open spaces, bus system, and industrial park.

Generally, students who live in farther zones have farther distances from home to the workplace. More students live in homes with ownership, more extensive area, and less cost in the farther zones. Additionally, the areas are more likely to have

parks/open spaces and near industrial parks/plants. However, they are less likely to have a bus system across. Students living in the farther zones must walk farther to see a bus stop, take more bus transfers to go to the university, and spend more travel time and cost to go somewhere. Comparing travel time and travel cost between using a motorcycle and bus within each zone shows significant differences in most cases (Table 4), reflecting a challenging transportation situation. Severe traffic congestion in the city, shown by Nguyen et al. (2019), might be a reason why travel time by motorbike is less than by bus. Along with the comparison of travel time and travel cost in Table 3, the Wilcoxon test confirms a negative difference in travel time and a positive difference in travel cost within the zones.

We found insignificant differences in the proportions of open markets or supermarkets among zones. That might be because retail services have covered a wide range and grown in HCMC and nearby as shown in the study of Tran et al. (2015).

Table 3 Characteristics of residential zones and tests for residential zone differences

Characteristics	Zone 1	Zone 2	Zone 3	Zone 4	Test result
	Mean (SD)				Kruskal-Wallis chi-squared
Distance from home to university (km)	1.29 (0.65)	4.00 (0.89)	7.06 (1.02)	14.20 (5.51)	277.99***
Distance from home to the workplace (km)	1.65 (1.20)	4.25 (3.89)	4.00 (1.92)	5.71 (3.56)	34.87***
Residential area (m ²)	20.35 (18.94)	27.22 (22.38)	34.88 (25.24)	62.82 (36.90)	79.79***
Residential cost (10 ⁶ VND/month)	1.37 (1.32)	1.41 (1.19)	1.09 (1.72)	0.77 (1.38)	30.98***
Distance from home to a bus stop (m)	178.55 (177.29)	266.38 (203.45)	393.50 (295.41)	310.66 (256.71)	45.93***
Distance from workplace to a bus stop (m)	124.09 (186.93)	199.87 (165.79)	713.90 (1182.55)	173.06 (219.61)	22.36***
Number of bus transfers to go to the university	0.97 (0.51)	1.27 (0.60)	1.46 (0.54)	2.02 (1.25)	66.08***
Number of bus transfers to go to the workplace	1.12 (0.48)	1.45 (0.93)	1.20 (0.41)	1.38 (1.54)	2.91
Travel time to go to the university by motorbike (min)	6.67 (5.47)	12.67 (5.39)	19.32 (6.33)	29.24 (11.23)	178.85***
Travel time to go to the university by bus (min)	9.73 (7.81)	21.32 (11.17)	35.78 (15.92)	43.22 (24.73)	157.35***
Travel cost to go to the university by motorbike (10 ³ VND)	6.11 (4.06)	8.14 (4.28)	19.66 (31.60)	42.22 (100.75)	103.12***
Travel cost to go to the university by bus (10 ³ VND)	2.90 (1.57)	3.78 (1.79)	4.26 (1.61)	6.07 (4.00)	51.93***
Travel time to go to the workplace by motorbike (min)	7.23 (5.00)	12.67 (8.31)	10.55 (5.01)	13.20 (9.66)	13.47**
Travel time to go to the workplace by bus (min)	10.85 (8.94)	21.70 (16.45)	18.30 (9.98)	216.73 (770.05)	19.22***
Travel cost to go to the workplace by motorbike (10 ³ VND)	5.82 (3.06)	9.57 (8.57)	7.45 (3.27)	11.07 (12.39)	8.81*
Travel cost to go to the workplace by bus (10 ³ VND)	3.35 (1.43)	4.10 (1.84)	3.60 (1.23)	3.21 (2.19)	4.10
	Proportion				X² value
Ownership (self, family, or relative ownership)	0.06	0.13	0.40	0.76	102.1***
Near open market or similar	0.98	0.95	0.94	0.93	3.34
Near supermarket	0.81	0.84	0.90	0.84	1.65
Near park/open space	0.56	0.68	0.78	0.73	9.48*
Have a bus system	0.95	0.84	0.80	0.77	13.61**
Near the industrial park/plant	0.26	0.40	0.58	0.73	39.03***

Significant codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

Table 4 Wilcoxon rank sum test for travel time and travel cost between motorcycle and bus in zones

Characteristics	W value			
	Zone 1	Zone 2	Zone 3	Zone 4
Travel time from home to university (min)	5353***	1295***	434***	600***
Travel cost from home to university (VND)	12034***	6153***	2442 ***	1754***
Travel time to go to the workplace (min)	394*	239**	84**	68·
Travel cost to go to the workplace (VND)	908***	758***	348***	162*

Significant codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

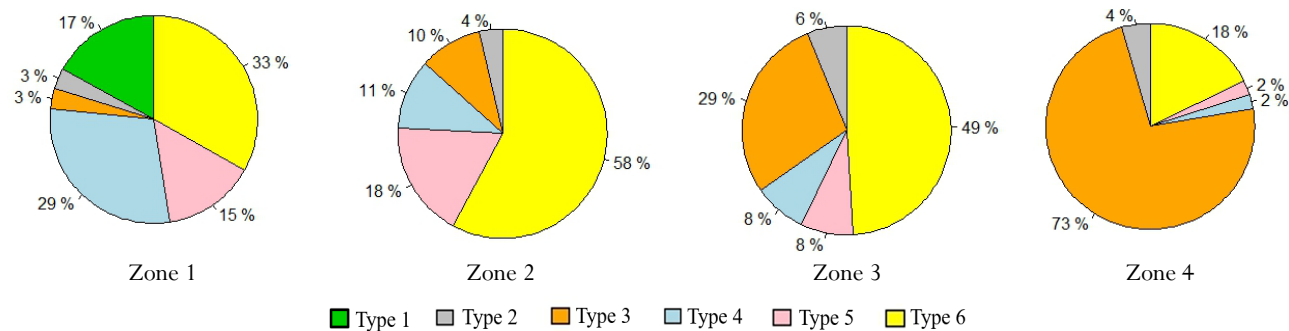


Figure 5 Allocation of housing types in zones

Except for the dormitory belonging to the campus, the other housing types are varied among zones, as shown in Figure 5. Type 2 has become more prevalent in farther zones. Generally, peer-shared houses are more prevalent in Zone 1, 2, and 3 than in Zone 4. In contrast, Type 3 shows the opposite tendency.

4.2 Individual Choices

The result of the model of residential zone choice is shown in Table 5. It reveals differences in residential zone preferences based on socio-economic characteristics.

Students in the second year are less likely to live in Zones 2 and 3, while students in the third or later are more likely to live in Zone 3. After the first year, many students might realize the pressure of a heavy studying schedule, including taking courses in the evening. Therefore, Zone 1 might become the better choice for them. From the third year, students become familiar with studying at the university. Also, this is a period when students have internships and do theses, so they will not have to go to the university for classes frequently. Therefore, Zone 1, with a higher price and smaller area (see Table 3), is less attractive and less likely to be chosen.

Students who frequently drive a motorbike to university will likely choose Zones 2 and 3. This might relate to the distance from the student's home to the university. With a motorbike, a student might have more freedom to stay in a farther place. In another aspect, students can choose more transport modes to live in Zone 1 because of the short distance, requiring less travel time. Bus usage was not significant, which might relate to a low rate of transport mode usage (see Table 1). The result is in line with the findings of Krishnapriya and George (2020); and Ralph and Brown (2019) for the relationship of mode choice behavior and residential location. Also, it extends to the issue of the mode usage frequency in residential locations.

Students who do not have a job tend to live near the university in Zone 1 rather than in Zone 4. In other words, students might choose Zone 1 not because of the opportunities for their part-time job. This is consistent with the fact that students with higher family incomes are less likely to choose farther zones, such as Zone 3 and Zone 4, to stay, or students living near the university have less pressure to have an income.

Another reason for the residential zone choice is because of whom they are living with. The result shows that students are less likely to live with friends in Zone 3 and 4 than in Zone 1 and with family. Students live in Zone 1 with their relatives rather than in Zone 4. Many students from other provinces choose to stay with relatives in HCMC. However, this depends on how far their relative's home is from the university. Unsurprisingly, Zone 4 is less attractive than Zone 1 in this case.

Finally, the probability of choosing Zone 2 reduces with the household size. This relates to the housing type of dormitory with the highest household size within the campus in Zone 1. The low magnitude of the factor shows less effect than other factors. Many students live in Zone 4 with their families, so their household size is also high. However, this parameter is not significant. Females are less likely to choose Zone 4 for their location than males. As anticipated, the zone's farthest distance makes it inconvenient and unsafe for a female student. Similarly, students who live alone or with others also do not choose Zone 4 for their stay. It can be said that Zone 4 is an inconvenient choice for students except for students living in their families with home ownership.

If the variables are omitted, the constants imply that students choose Zone 4 rather than Zone 1. However, they are less likely to choose Zones 2 or 3. This might be related to the ratio of home ownership and the level of convenience of the zones, as shown in Section 4.1.

Table 5 Multinomial logit model of residential zone choice

Variables	Zone 2		Zone 3		Zone 4	
	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value
Constant	-0.45	-0.43	-1.23	-0.84	2.43*	2.06
Study in the second year	-0.79	-1.73	-1.27	-1.66	-0.60	-0.77
Study in the third year	0.73	1.64	1.50**	2.64	-0.87	-1.14
Study in the fourth year or more	0.72	1.46	1.26*	2.04	0.21	0.27
The frequency of motorbike usage to the university is higher than twice a week	1.42*	2.44	2.31*	2.09	1.11	1.43
Do not have a part-time job	-0.34	-0.97	-0.57	-1.36	-1.04	-1.85
Family income is 50 mil. VND/month or higher	-0.82	-1.09	-2.23*	-1.87	-3.18*	-2.32
Live with friends	-0.14	-0.19	-1.83**	-2.87	-5.24***	-7.20
Live with relatives	1.12	1.38	-0.59	-0.73	-2.63***	-3.39
Live with others	-0.15	-0.13	-0.002	-0.002	-3.11*	-2.35
Household size	-0.20*	-1.89	-0.06	-0.50	0.06	0.51
Female	-0.50	-1.56	-0.37	-0.92	-0.93	-1.84
Log-likelihood at convergence	-290.56					
McFadden Rho-squared	0.27					

significant codes: ***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1

4.3 Implications for Policymaking

Embedded in socio-cultural similar contexts, the student housing markets in Southeast Asian cities might share common characteristics and the discussions here can provide stakeholders with an understanding of residential zones and implications for developing the market.

- Residential zones from a university are appropriate for analyzing students' allocation. They could be used in analyzing the student housing market.

Because significant differences are found in residential zone characteristics and individual preferences for the residential zones, policymakers could consider the differences and influential factors in managing and developing the student housing market. Also, housing providers could show attractive characteristics in their products relating to the residential zones. Furthermore, universities can refer to the residential zones to monitor their students' residence and prevent the negative impacts of off-campus student housing.

- Residential zones should be considered simultaneously with transport systems and travel behavior.

The differences in transport systems such as bus system, bus stop, bus transfer, travel time, and travel cost of transport modes for commuting trips increase the differences among zones. In another aspect, the frequency of transport mode usage as a motorcycle impacted residential zone choice. If the transport system changes, there will be a change in travel behavior and then residential zone choice. This adds a rebound influence direction to the findings of the impact on travel behavior of residential locations (Ralph and Brown, 2019). If student houses are developed in certain areas, specific bus lines could be set up to support students' travel demands.

In contrast, projects in developing student houses should be in an area with a good public transport network. It can be in farther zones but through metro lines. In the case of IUH in HCMC, the Suoi Tien area, where a metro line will work soon, could be used as a good example.

- Opportunities for part-time jobs and relevant built environment variables are remarkable in residential zones.

The results show that students living in farther zones have more difficulty accessing part-time jobs because of farther distances and limited transport conditions. However, they are the group likely to have a part-time job. This clarifies a disadvantage for students who cannot live in nearer zones for specific reasons, including low incomes. Therefore, considering opportunities for part-time jobs in residential zones is necessary for developing the student housing market.

5. Conclusion

We have classified students' residential zones around a university, taking a case in HCMC, addressed their differences, and examined influential factors in students' preferences. Significant differences were found in the distance from home to workplace, home ownership, residential area, residential cost, transportation, and other built environment characteristics relating to market/supermarket, open spaces, bus stop, and industrial park/plants. Significant student preference factors to the zones include academic levels, motorcycle usage, employment status, family income, household member, household size, and gender.

The results suggest that policymakers and practitioners should consider residential zones as students' allocations in developing the student housing market. Transport systems, travel behavior,

and opportunities for part-time jobs are remarkable aspects that should be considered simultaneously. The implications could help other developing cities, especially those in Southeast Asia, where the social and cultural situations are similar.

A limitation of the scope meant that we focused on the residential zone around a university and could not consider mutual interference with other universities' student location zones. For a comprehensive review of a city's student housing market, mutual interference must be investigated. In this aspect, the study could work as a basic. If residential location zones investigated in this study can represent residential locational zones around a university in the city, mutual interference could be generalized. Also, we suggest that both questionnaire data and map data should be mined to explore spatial information besides behavior and enhance policy analyses of the student housing market.

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References

- Adama, J.U., Aghimien, D.O., and Fabunmi, C.O. (2018). Students' Housing in Private Universities in Nigeria: Influencing Factors and Effect on Academic Performance. *International Journal of Built Environment and Sustainability*, 5(1): 12-20. Available at: <https://doi.org/10.11113/ijbes.v5.n1.242>.
- Donaldson, R., Benn, J., Campbell, M., and De Jager, A. (2014). Reshaping urban space through studentification in two South African urban centres. *Urbani Izziv*, 25: S176–S188. <https://doi.org/10.5379/urbani-izziv-en-2014-25-supplement-013>
- Franz, Y. and Gruber, E. (2022). The Changing Role of Student Housing as Social Infrastructure. *Urban Planning*, 7(4): 457–469. Available at: <https://doi.org/10.17645/up.v7i4.5661>
- Frenkel, A., Bendit, E., and Kaplan, S. (2013). Residential location choice of knowledge-workers: The role of amenities, workplace and lifestyle. *Cities*, 35: 33–41. Available at: <https://doi.org/10.1016/j.cities.2013.06.005>
- Garg, M., Gupta, K., and Jha, R. (2014). An Empirical Study on Market Research of Organized Students' Housing Industry in India. *International Journal of ICT and Management*, 143.
- General Statistics Office (2022). *Statistical Yearbook of Viet Nam 2022*. Statistical Publishing House, Hanoi
- Gregory, J.J. (2020). Studentification and Urban Change in South Africa. In: Massey, R., Gunter, A. (Eds.) *Urban Geography in South Africa. GeoJournal Library*. Springer, Cham. Available at: https://doi.org/10.1007/978-3-030-25369-1_14
- Gu, H., and Smith, D.P. (2020). 'Living off the campus': urban geographies of change and studentification in Beijing, China. *Urban Geography*, 41(2): 205–224. Available at: <https://doi.org/10.1080/02723638.2019.1659071>
- Hammad, D.B., Musa, J.M., Rishi, A.G, and Ayuba I.I. (2013). Criteria for the Selection of Students Accommodation Model in Nigeria Tertiary Institutions Using Analytic Hierarchy Process Criticality Based Maintenance Framework for Reinforced Concrete Structures in Onshore Process Plants View project, *Academic Research International*, 4(5): 550–556
- Hamid, H.A., Wah, Y.B., Xie, X.-J. (2016). Effects of difference type of covariates and sample size on parameter estimation for multinomial logistic regression model. *Jurnal Teknologi* 78(12–3): 155–161. Available at: <https://doi.org/10.11113/jt.v78.10036>
- Hamid, H.A., Ismail, S.R., Sulaiman, S.A., and Amin, N.A.M. (2020). Assessing the Effect of Different Covariates Distributions on Parameter Estimates for Multinomial Logistic Regression (MLR). *IOP Conference Series: Materials Science and Engineering*, 767: 012014. Available at: <https://doi.org/10.1088/1757-899X/767/1/012014>
- Ho Chi Minh City Statistics Office (2022). *Statistical Yearbook 2021*. Tong Hop Thanh Pho Ho Chi Minh, Ho Chi Minh City.
- Kolawole, O.A. and Boluwatife, A.R. (2016). Assessment of The Factors Influencing Students' Choice of Residence in Nigerian Tertiary Institutions'. *Sains Humanika*, 8(2): 39–47. Available at: <https://doi.org/10.11113/sh.v8n2.768>
- Krishnapriya, M.G. and George, S.T. (2020). Mode choice behavior of students, integrating residential location characteristics: a study from Kochi City, India. *European Transport - Trasporti Europei*, 79: 1–17
- McBride, Y. (2017). Future of student housing: meeting emerging student needs. *On the Horizon*, 25(3): 190–196. Available at: <https://doi.org/10.1108/OTH-05-2017-0026>.
- Nguyen, D. C., Hoang, H. D., Hoang, H. T., Bui, Q. T., and Nguyen, L. P. (2019). Modal Preference in Ho Chi Minh City, Vietnam: An Experiment With New Modes of Transport. *SAGE Open*, 9(2). Available at: <https://doi.org/10.1177/2158244019841928>
- Nguyen, N.T., Miwa, T. and Morikawa, T. (2020). Demand forecast of public transportation considering positive and negative mass effects: *Transportation Research Part D: Transport and Environment*, 85: 102466. Available at: <https://doi.org/10.1016/j.trd.2020.102466>.
- Pham, T.N.H. and Nguyen, T.N. (2021). Factors Affecting the Decision of Room Choice of Out-of- Province Students Studying at Ho Chi Minh City Industrial University. *Proceeding of the 3rd Young Scientists Conference*. Industrial University of Ho Chi Minh City, Ho Chi Minh City, Vietnam.
- Prada, J. (2019). Understanding studentification dynamics in low-income neighbourhoods: Students as gentrifiers in Concepción (Chile). *Urban Studies*, 56(14): 2863–2879. Available at: <https://doi.org/10.1177/0042098018807623>.
- R Core Team (2023). *R: A Language and Environment for Statistical Computing*. Vienna, Austria, Available at: <https://www.R-project.org/>.
- Ralph, K.M. and Brown, A.E. (2019). The role of habit and residential location in travel behavior change programs, a field experiment. *Transportation*, 46(3): 719–734. Available at: <https://doi.org/10.1007/s11116-017-9842-7>.

- Revington, N., Moos, M., Henry, J., and Haider, R. (2020). The urban dormitory: planning, studentification, and the construction of an off-campus student housing market. *International Planning Studies*, 25(2): 189–205. Available at: <https://doi.org/10.1080/13563475.2018.1552565>.
- Revington, N. (2021). Age Segregation, Intergenerationality, and Class Monopoly Rent in the Student Housing Submarket. *Antipode*, 53(4): 1228–1250. Available at: <https://doi.org/10.1111/anti.12710>.
- Sulaiman, N., Ghani, Z.A. and Mohammed, M.I. (2018). Student Housing in Malaysia: A Hidden Resilient Real Estate Investment Opportunity. *Advanced Science Letters*, 24(6): 4626–4628. Available at: <https://doi.org/10.1166/asl.2018.11669>.
- Susanti, R., Soetomo, S. and Buchori, I. (2020). Effects of the Studentification Process on Spaces Around a Campus: Transforming Suburban Areas. *International Journal of Scientific & Technology Research*, 9(3): 5998–6007.
- Thomsen, J. and Eikemo, T.A. (2010). Aspects of student housing satisfaction: A quantitative study. *Journal of Housing and the Built Environment*, 25(3): 273–293. Available at: <https://doi.org/10.1007/s10901-010-9188-3>.
- Train, K. (1986). *Qualitative Choice Analysis*. The MIT Press. London, England
- Tran, T.A. (2015). Assessing the development potential of modern retail in Vietnam. *Ho Chi Minh City Open University Journal of Science*, 5(1): 31–39. Available at: <https://doi.org/10.46223/HCMCOUJS.econ.en.5.1.1007.2015>
- Vi, D.H.T., Trung, T.D., Chi, T.T.B., Chung, D.T.K., and Tu, H.G. (2020). The factors affecting the choice of accommodation for students in Vietnam National University - Ho Chi Minh City. *Journal - Economics - Law and Management, Science & Technology Development*. 4(4): 1154–1166. Available at: <https://doi.org/10.32508/stdjelm.v4i4.637>.