THE BEHAVIOR OF NON-REGISTERED POPULATION FOR CHOOSING THE ACCOMMODATION IN BANGKOK (CASE STUDY : CONDOMINIUM)

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THE BEHAVIOR OF NON-REGISTERED POPULATION FOR CHOOSING THE ACCOMMODATION IN BANGKOK (CASE STUDY : CONDOMINIUM)

MARUT KLUDCHAROEN

A Dissertation Submitted in Partial Fulfillment of the Requirements

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THE DISSERTATION TITLED

THE BEHAVIOR OF NON-REGISTERED POPULATION FOR CHOOSING THE ACCOMMODATION IN BANGKOK (CASE STUDY : CONDOMINIUM)

BY

MARUT KLUDCHAROEN

HAS BEEN APPROVED BY THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY IN PHILOSOPHY(ECONOMICS) AT SRINAKHARINWIROT UNIVERSITY

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Title	THE BEHAVIOR OF NON-REGISTERED POPULATION FOR CHOOSING THE ACCOMMODATION IN BANGKOK (CASE STUDY : CONDOMINIUM)
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The purposes of this research were as follows: (1) the factors which influenced residential choice decisions for buying and renting condominiums; (2) the factors which influenced residential choice decisions to buy nearby condominiums for their own residence by using Revealed Preference method (RP); (3) the factors which influenced residential choice decisions to buy nearby condominiums for their own residence, located close to or far away from rail transit stations following the simulations obtained by using the Stated Preference method (SP). The research findings that used the Revealed Preference method (RP) found that the factors that influenced the condominium choice decisions of the non-registered population, such as the education at the Bachelor's degree or post-graduate level, income, the number of members of the household, traveling expenses and the use of private cars, expense for traveling by meter taxis, duration of travel to work by private cars, condominium size, duration of travel from their residence to the shopping mall, and occupations that positively influenced the probability of condominium choice decisions. Moreover, it was found that the factors that influenced condominium choice decisions were located near rail transit stations included divorced couples, price per square meter, duration of travel by rail transit to work, duration for traveling by meter taxi to their office which positively influenced the probability of condominium choice decisions. In terms of Stated Preference (SP), the simulation was under the following conditions: usable space, the price of the condominium and monthly income were influential in positively influenced the probability of condominium choice decisions when located near rail transit stations. The simulation was under the condition of the budget for buying the condominium, referred to the size of condominium and the number of bedrooms were influential in terms of positively influencing the probability of condominium choice decisions when located near rail transit stations.

Keyword : Non-registered population, Condominium, Stated Preference, Revealed Preference

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CHAPTER 1

INTRODUCTION

1.1 Background and Rationale

Bangkok is the capital city of Thailand. Many government agencies are established along to each district of Bangkok. For this reason, Bangkok is become to be the center of economic, trade, and education as implicitly as the result to Bangkok has the largest number of population in Thailand. A lot of people move into Bangkok due to Bangkok is the center of economic and community and there are a huge engagement that resulted to people actually relocate to Bangkok for seeking jobs or careers and continually for studying. These people don't change their house registration to Bangkok, so people are call " Latent Population ". There are 2 kinds of the commuter; Non-registered Population and Commuter Population. Non registered population could stay overnight in Bangkok, and according to the number of non-registered population data is shown in picture 1

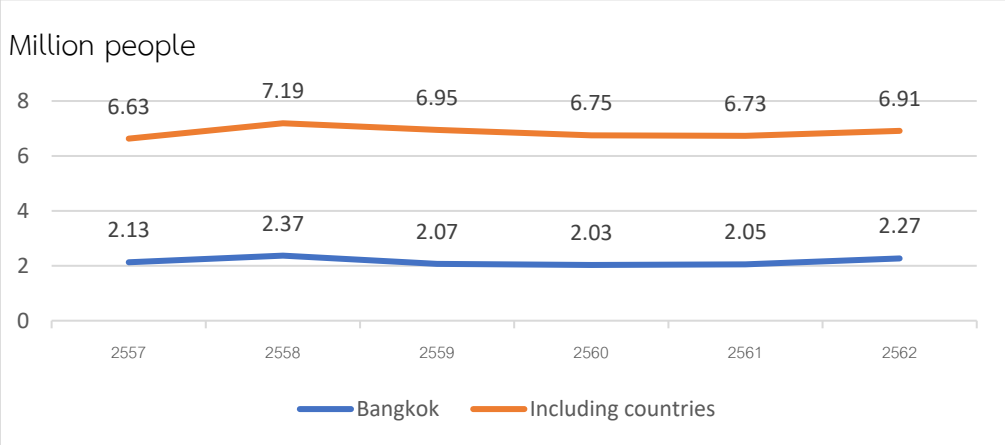


Figure 1 The number of non-registered population in Bangkok

Picture 1 showed that the number of non-registered population has changed every year until 2014 to 2019. The number of non-registered population is 2.37 million in 2015 which it is the largest number population and the number of non registered population is 2.03 million in 2017 which it is the lowest number of non-registered

population. Moreover, the ratio of non-registered population in 2019 is 32.65% of all non registered population in Thailand which it is the highest level. The ratio of non registered population in 2016 is 29.78% of all non registered population in Thailand which it is the lowest level.

Furthermore, another kind of commuter is Commuter Population. They travel to Bangkok for work and then they go back to the original town. The number of commuter population shows in picture 2

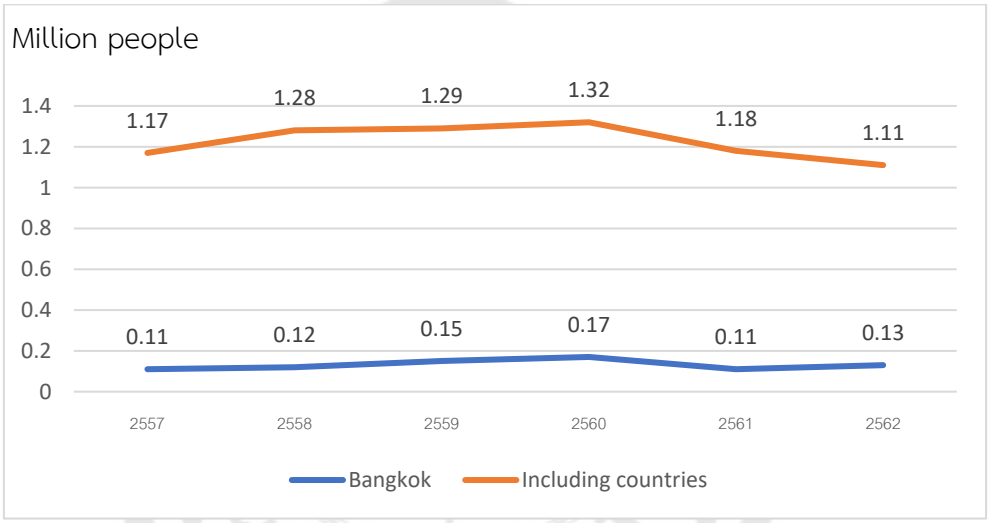


Figure 2 The number of commuter population in Bangkok

Picture 2 showed that the number of commuter population has changed every year until 2014-2019. The number of commuter population is 2017 is 0.17 million which it is the highest level. In 2018, The number of commuter population is 0.11 million which it is the lowest level. Moreover, the ratio of commuter population in 2017 is 12.88% of the all of commuter population in the country. It is in the highest level. The ratio of commuter population in 2018 is 9.32% of the all of commuter population in the country. It is the lowest level.

According to the number of non registered population and commuter population, people who are in non registered population are necessary to choose the residential location, but commuter population stay over night in their house and travel to work in Bangkok by any transportations. They are possible to decide for

choosing the residence in Bangkok. People will choose the residential location from type of accommodation to be house and condominium

Nowadays the accommodation or residence in Bangkok are mainly developed pattern to be a condominium. These people are necessary to choose the residence that is suitable for traveling or working. The problem is found that the estate price in Bangkok is so expensive. Some people could not buy the house in Bangkok and there is effected to change in their consumption behavior what people lead to buy the house but they instead choose the condominium in choice due to the condominium price is cheaper than the house. The number of condominium unit is more increasingly by showing in picture 3

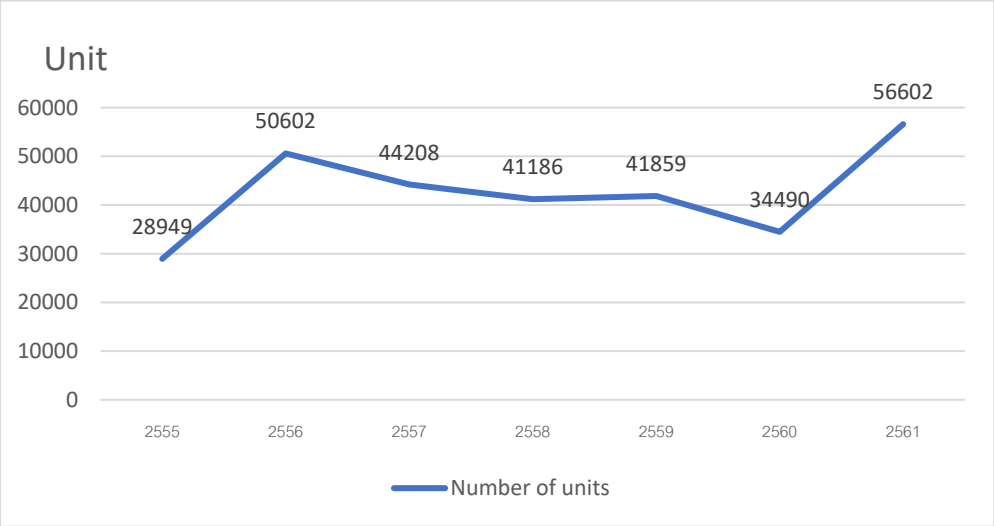


Figure 3 The number of condominium registration in Bangkok

Picture 3 showed that the number of condominiums has changed every year until 2012 to 2018. The number of condominium registration in 2018 is 56,602 rooms which this year is the highest level for condominium registration. In 2012, the number of condominium registration is 28,949 rooms which this year is the lowest level for condominium registration. Moreover, the condominium registrar rate is increasing to the higher level. The condominium registration rate is 74.80% in 2013 and 64.11% in 2018 by the sequence. The condominium registration rate is decreasingly in 2017 and 2014. There is at -17.60% in 2017, and -12.64% in 2014 by the sequence. The condominium registration tends to higher level. The reason what make people need for a condominium

because the estate price in Bangkok is more expensive that effect to people could not buy house for their own-residence.

Another significant factor what it effects to people needs more the condominium is the traffic condition in Bangkok. People must be waste of time in the traffic and transportation, and the traffic condition is the major factor that made other problems such as air pollution and noise. People face the lacks in quality of life. People always travel or transit by the private cars that reflect to cause of this problem. The government campaigns to people for using the public transportation instead of their private cars. There are many kinds of public transportation such as public bus, van or coach, sky train or underground, and express boat. Public transit system could solve the traffic condition and respond to traveling behavior. The sky train and underground are the highest level for choice due to reducing in traffic condition, convenience, sustainability on time. Passenger can calculate in the duration. Furthermore. It could reduce any pollution. According the studies, data showed condominiums along to rail transit line have been developed to be the residence. In the other hand, the condominium which is located distant rail transit statuon also has been developed to be the residence.

Nowadays, the behavior for residential choice has been changed from the past. People choose the house for own-residence according to the economic and price or area of the residence. People choose to buy condominium in their residential choice. As result to the condominium enterprise has developed the project of condominium along to rail transit line for sell and respond customer needs. The government policy is devoted to the transportation by traveling with sky trains, which the government has approved the rail project in many provinces to connect Bangkok such as Pathum Thani, and Samut Prakan to distribute the prosperity from the urban to suburban. The transits by local train or distance train is more speedy and convenient than was.

According to the data, found non-registered population who stay out of Bangkok also need to buy the condominium with nearby and distnt the rail transit station, and the another one need to rent the residences where are nearby and distant the rail transit station. The group of people choosing nearby the rail transit

station has different reasons and conditions from the group of people choosing distant the rail transit station.

For these reasons, the researcher interests in research about the behavior for residential location choice decision in Bangkok that including for buying and renting condominium. Meanwhile, the residential choice decision as condominium with nearby and distant from rail transit station is included in this study and refers to the factor in the residential choice decision. Moreover, the researcher studies the rents condominium with nearby and distant rail transit station about the factor in the residential choice decision by applying Stated Preference (SP) technique to analyze the behavior for residential location choice decision in Bangkok.

The research shows analyzed factor in residential location choice decision to know about influencing factors that effect to the behavior for residential location choice decision of people who relocate from their hometown into Bangkok. Then, the data of rents condominium could be presented to the government and other agencies for plans and solve the problem in the relocation. Moreover, the data from the research could be taken onto the residential policy and promote to the people for getting their own- house. In addition, the data could use for solve about the difference of income to choose the residence by owned which the gab of income is the main cause in Thailand. Importantly, the data is referred to use for the infrastructure policy to invest about the transportation system what people can travel from the sub urban into the central of the city, and people are potential to buy the residence for own. Likewise, this is a distribution from the central city to sub urban or other provinces in the civilization together.

1.2 Purpose of The Study

The researcher has purposes of this study

1. To study factors what impact on residential location choice decision between purchasing and renting condominium by Revealed Preference (RP) method.

2 . To study factors what impact on residential location choice decision with nearby and distant from rail transit station by Revealed Preference (RP)

3 . To study factors impact on residential location choice decision between purchasing and renting condominium with nearby and distant from rail transit station in the simulators by Stated Preference (SP)

1.3 Significant of The Study

1. To analyze factors what influence to residential location choice decision between purchasing and renting condominium where is located nearby and distant from rail transit station.

2. To analyze factors what influence to residential location choice decision as condominium where is located nearby and distant from rail transit station.

3. To evaluate factors for the residential choice decision between purchasing condominium where is located nearby and distant from rail transit station in the simulating model.

4. To present the residential location choice policy to the government for supporting to a dispersion and city expansion.

1.4 Advantage of The Study

1. To know about the behavior of non-registered population in Bangkok in residential choice decision as condominium which it leads to present the policy for the condominium enterprise and development.

2. To percept about the difference between non-registered population and people who are used to be non-registered population before, that lead to present the residential policy for the lower income people to the government agencies.

3. To recognize the changes tendency from non-registered population to be Bangkokian that lead to present the policy about the dispersion and transportation plan.

1.5 Scope of The Study

1.5.1 Research Population

The population used in this study were people who purchased for own condominium and rented condominium with nearby and distant rail transit station in Bangkok.

1.5.2 Research Sample

The sample used by random sampling were 400 samples. There are 2 types of research sample for this study; The residential location choice and rented condominium choice, by categorized as follow;

1.The residential location choice decision were 200 samples.

1.1 The residential location choice decision as condominium where is located nearby rail transit station were 100 samples.

1.2 The residential location choice decision as condominium where is located distant from rail transit station were 100 samples.

2.The rented condominium choice decision were 200 samples.

2.1 The rented condominium choice decision as condominium where is located nearby rail transit station were 200 person by separated for 100 samples.

2.2 The rented condominium choice decision as condominium where is located distant from rail transit station were 100 samples. were 200 person by separated for 100 samples.

Variables of this study

Independent Variables

1. Personal Information

1. Gender
2. Age
3. Status
4. Education
5. Occupation
6. income
7. Family income
8. The number of cars
9. Member

2. Residential Choice decision factor

2.1 Transportation for work

1. Frequency for traveling to work

2. Duration for traveling

3. Expense for traveling

2.2 Residential factor

1. Size

2. Price

3. Convenience and Facilities

4. The number of floors

2.3 Residential Location factor

1. Distance from the facilities

2. The density of population

3. The educational institution

4. Hospital

5. Common fee

Dependent Variables is defined to

Model 1: Residential condominium choice decision Variables

Y = *0* mean to rent condominium choice decision

Y = 1 means to residential condominium choice decision

Model 2 : Residential choice decision that along to rail transits line variables

Y = 0 means to Residential choice decision for external rail transits line

Y = 1 means to residential choice decision along to rail transits line

1.6 Definition Terms

Non-registered Population is people who stay overnight in Bangkok, don't have the account in Bangkok registrar office, and they are in the original town of registration.

Commuter Population is people who go for work from another province to Bangkok, transit in the round trip for each day, and they officially are in the registrar office of their town.

Residential purchaser is people who buy the residence in condominium, used to be non-registered population first or their status are still in non-registered population. In case, people who buy the condominium but they don't change their name into Bangkok registrar office.

Residential rents is people who permanent rent the condominium, are in non-registered population status.

Residence with nearby rail transit station is the residence in condominium type where is located along to the BTS and MRT line. It's not far over 500 meters from the station.

Residence with distant rail transit station is the residence in condominium type where is located in external area of rail transits line. It's far from the station about 1 kilometer or more.

Revealed Preference (RP) is the method for collecting data decision that related to residential location choice completely in choosing the residence first.

Stated Preference (SP) is the method for collecting data decision by using the simulation to choose in questionnaire by the respondents.

1.7 Conceptual framework

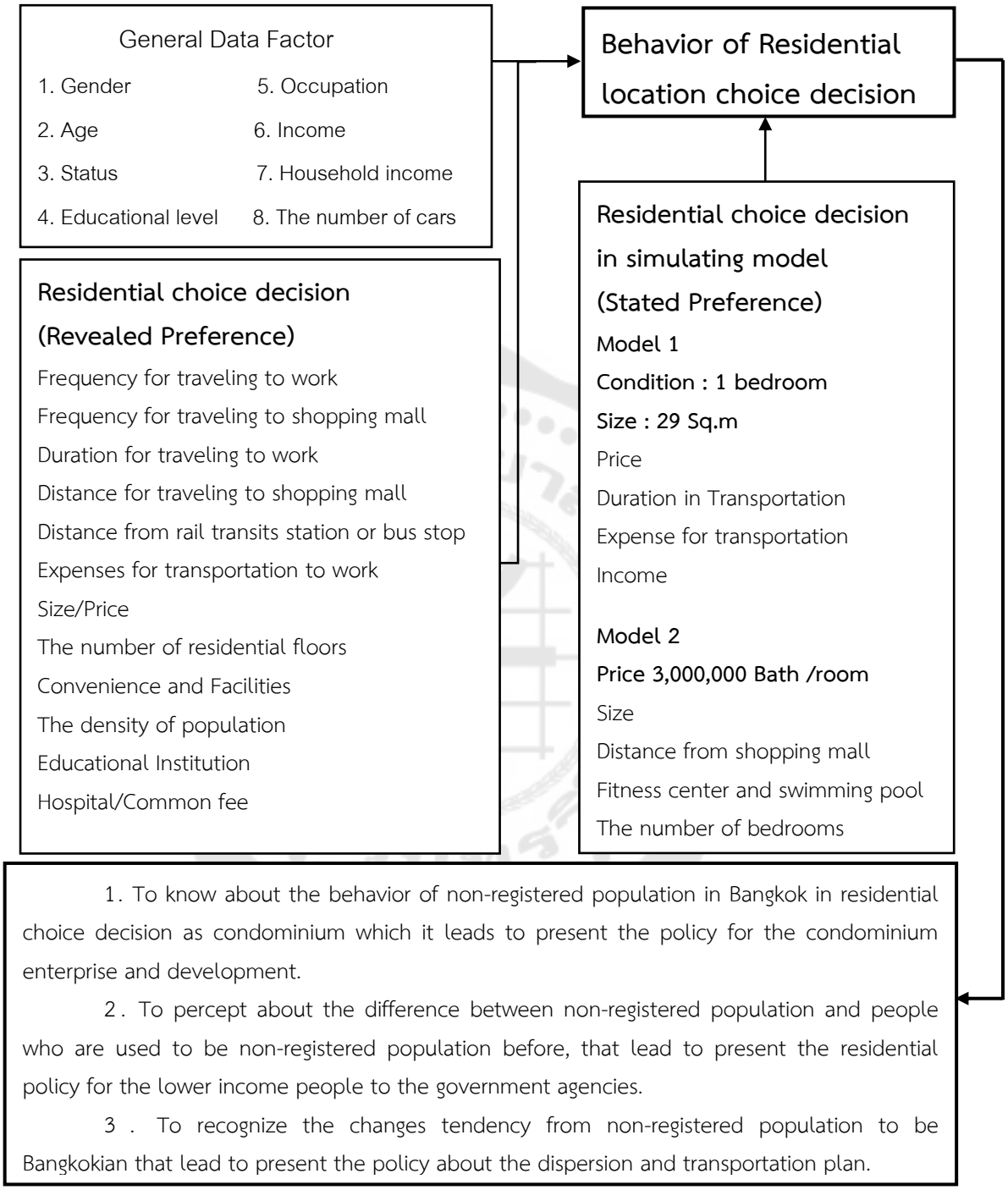


Figure 4 Conceptual framework

1.7.1 Hypothesis Research

According to the conceptual framework. The research could assume the hypothesis research

Table 1 Hypothesis of the study

Variables	Measurement	Reason	Correlation	Reference
Personal Data Factor				
Gender	Dummy variable	Male is strongly braved in residential choice decision more than female.	+	Jonas De Vos et al., 2016 Gusti Ayu Andani et al., 2020
Age	No. Years	The residential choice decision person should be confident and sustainable in the job and income. People who are in teenage or middle-aged must frequently change the job.	+	Carola de Groot et al., 2011 Jonas De Vos et al., 2016
Status	Dummy variable	The residential choice decision what person should make the sustainability to yourself. The marriage couple plan in details more than the single person.	+	Gusti Ayu Andani et al., 2020
Educational Level	Dummy variable	The residential choice decision person must have capable income to buy the residence. People who are higher degree in education are resulted to income and reasonable in the choice decision .	+	Carola de Groot et al., 2011 Jonas De Vos et al., 2020
Career	Dummy variable	The residential choice decision what people have a sustainable income and they intent to get a progressive job or higher job position.	+	Jonas De Vos et al., 2016 Jia Guo et al., 2020

Table 1 (Continue)

Variable	Measurement	Reason	Correlation	Reference
Personal Data Factor				
Income	Bath	Once people get more wage or income, they also need to buy the residence for own. Residential choice decision could response for a convenience in their life.	+	Patricio E. Pe´rez et al., 2003 Gusti Ayu Andani et al., 2020
No. Car	car	People who stay along to rail transits line are necessary to decreasingly for using private cars.	-	Gusti Ayu Andani et al., 2020 Jonas De Vos et al., 2020
No. Member	Person	The number of family member is increasingly, and people deicide to get own- residence.	+	Gusti Ayu Andani et al., 2020
Residential Choice Decision factor				
Frequency for traveling	Time/Week	People decide to choose the residence from the convenient context due to there is longer transportation in their life.	+	From theoretical studies
Expenses for traveling to work	Bath	People try to reduce the cost in transportation in order to condition of cost and burden in their life.	+	Patricio E. Pe´rez et al., 2003 Jonas De Vos et al., 2016
Duration for traveling	minute	People need to reduce the duration in transportation for taking time to do other activity	+	Patricio E. Pe´rez et al., 2003 Chaug-Ing Hsu et al., 2006
Size	Sq.Metre	People desire the convenience and the huge private space..	+	Jia Guo et al. , 2020

Table 1 (Continue)

Variables	Measurement	Reason	Correlation	Reference
Price	Cost/Metre	Some people choose the residence in the cheaper price due to the condition for budget and cost in their burden life.	-	Jae Hong Kim et al., 2005 Jia Guo et al., 2020
Residential Choice Decision factor				
The number of resident floors	No. piece	People adore the residence in higher project.	+	Gusti Ayu Andani et al., 2020
Convenience and facilities	Dummy variable	People desire to rest after finishing from work. Then, they need the residence where contains with fitness center and pool.	+	Jia Guo et al., 2020
Distance to station(BTS,MRT,Bus stop)	Kilometer	People need the residence nearby the transportation network.	-	Jia Guo et al., 2020
The density of Population	A person /Sq.Km.	The area with the largest number of population become to be career source for occupation.	+	Jae Hong Kim et al., 2005 Chaug-Ing Hsu et al., 2006
Educational Institution	place	The family with many children must be aware to the convenience for traveling to send their children to school. They will choose the residence where is nearby the educational institution.	+	Jae Hong Kim et al., 2005 Jia Guo et al., 2020
Hospital	place	The family need the residence where is located nearby hospital.	+	From theoretical studies
Frequency in traveling to shopping mall	Time/weel	As people transit for more, so they mainly choose the residence from the convenient transportation.	+	From theoretical studies

Table 1 (Continue)

Variables	Measurement	Reason	Correlation	Reference
Distance from the convenient place	Kilometer	People desire to rest after finishing work, so People also choose the residence where is located near the convenience and facilities.	-	Jia Guo et al., 2020
Common fee	Bath	People need to pay the common fee as the lowest fee.	-	From theoretical studies

Source : Data collection by the researcher

CHAPTER 2
LITERATURE REVIEW

For this study, the researcher studied research relates and presented on the next topic.

1. Preferences and Selection Probabilities
2. Alternative theory of transportation and residential choice
3. Research Relates

2.1 Preferences and Selection Probabilities

(McFadden, 1974) explained the study about alternative behavior that contain with 1. Purpose of choice and set of choice decision 2. The observation in choice decision 3. The individual term in choice decision and behavioral dispersion of population.

The data from the observation and examine were drown to be the behavior for random sample. The random stage sampling is from population to be individual participants by determined x to be the purpose of choice S (vector) for measurement in choice decision character. The individualized photos were random. According to part of character in $s \in S$ to take $P(x|s,B)$ showed about the condition what was possible to use the individualized character to random sampling in x and the measurement in s and set of choice B. From the character choice of s and B showed to picture possibly to the formula from s show that probability condition of individual person. From the random sampling in choice x to measure in the attribute of s and alternative in choice set B. From the choice in attribution of s and the alternative B could be in an equation that Multinomial distribution with probability choice in $P(x|s,B)$ จาก $X \epsilon B$

The personal behavior in h function according to an attribute measurement of vector s and the probability in choice set B of member B which the individual behavior in model A of behavior set H that H was demand functions as the result to maximization of specific utility function and H was the set of demand functions as the result to maximization of some utility function

The condition for describe to population in h, it was defined the probability of π on subset h. For the behavior choice distribution in population, the probability in choice as individual which they were from the random sampling to choose x. Then the attribute measurement of s and set choice B were equal as

$$P(x|s,B) = \pi[\{h \in H|h(s,B) = x\}] \quad 2.1$$

To simulate for each population got vector in the attribute measurement of s and the alternative j where j= 1 ,… ,J and to explain the vector in character x_j which Utility function could be the equation as follow;

$$U = V(s,x) + \varepsilon(s,x)$$

Then V was. nonstochastic that affected to the represents of population's trend and ε was stochastic that affected to idiosyncratic for each person who were in choice x. The individual choice that made Maximizes Utility could be h_ε showed that the character of behavior and $B = \{x_1, \ldots, x_j\}$ the behavior in random sampling from population with attribute s and set choice B for choosing x_i equal as

$$P_i \equiv P(x_i|s,B) = \pi[\{h_\varepsilon(s,B) = x_i\}]$$

$$= P[\varepsilon(s,x_j) - \varepsilon(s,x_i) < V(s,x_i) - V(s,x_i) \; for \; all \; j \neq i \quad 2.2$$

Where the condition

$$F(\varepsilon_1, \ldots, \varepsilon_j) = \pi[\{h_\varepsilon \epsilon H | \varepsilon(s,x_j) \leq \varepsilon_j \;\; for \; j = 1, \ldots, J\}]$$

To F_i showed about partial derivative F of i and to showed $V_i = V(s,x_i)$ could be the equation as

$$P_i = \int_{\varepsilon-t}^{\varepsilon+t} F_i\left(\varepsilon + V_i - V_J, \dots\dots, \varepsilon + V_i - V_J\right) d\varepsilon \qquad 2.3$$

From the equation above showed the necessity of attribution and probability condition of each choice.

The equation was considered in the probability in basic choice of Luce(1959) that related in choice 1 was independent from choice decision in equation 2.2 or choice equation 2.3 following to 3 hypothesis;

For case 1 (Independence of Irrelevant Alternatives) All of the choice in set B was possible and it was the attribute measurement of s and x, y member of B

$$P(x|s,\{x,y\})P(y|s,B) = P(y|s,\{x,y\})P(x|s,B) \qquad 2.4$$

The condition was related to the equation 2.3 and reach into the probability finding of Simple econometric specification choice

when $P(x|s,B)$ was positive , the equation 2.4 showed $P(x|s,\{x,y\})$ Positive and

$$\frac{P(y|s,\{x,y\})}{P(x|s,\{x,y\})} = \frac{P(y|s,B)}{P(x|s,B)} \qquad 2.5$$

The condition y in choice x was various in choice B that both of its also were the probability as the same as for binary choice of y over x

For case 2 (Positivity) $P(x|s,B) > 0$ All of the choice in set B was possible and it was the attribute measurement of s , and $x \in B$

The choice consideration x, y, z choice in set B and where $P_{xy} = P(x|s,\{x,y\})$ specified to $P_{xx} = \frac{1}{2}$ according to the equation 2.4

$$P(y|s,B) = \frac{P_{yx}}{P_{xy}} P(x|s,B) \qquad 2.6$$

And

$$1 = \sum_{y \in B} P(y|s,B) = \left(\sum_{y \in B} \frac{P_{yx}}{P_{xy}}\right) P(x|s,B) \qquad 2.7$$

That it could be in the probability equation multiple choice of binary

$$P(x|s,B) = \frac{1}{\sum_{y \varepsilon B}(\frac{P_{yx}}{P_{xy}})} \qquad 2.8$$

From x, y, z in the equation 2.6 and the multiple in the condition then;

$$\frac{P_{yx}}{P_{xy}} = \frac{P_{yz}/P_{zy}}{P_{xz}/P_{zx}} \qquad 2.9$$

Taking z to be a "benchmark" member of choice in set B and specified to $V(s,x,z) = \log(\frac{P_{xz}}{P_{zx}})$ it could be in the equation as

$$P(x|s,B) = \frac{e^{V(s,x,z)}}{\sum_{y \in B} e^{V(s,y,z)}} \qquad 2.10$$

Where function V(s,x, z) was hypothesis for s that was measured taste effect, Taking x to be choice alternative effect and to take z to be alternative set effect

For case 3 (Irrelevance of Alternative set Effect) To specified $V(s,x,z)$ was the probability in choice of the equation as follow;

$$V(s,x,z) = v(s,x) - v(s,z) \qquad 2.11$$

It could be the equation then;

$$P(x|s,B) = e^{v(s,x)} / \sum_{y \in B} e^{v(s,y)} \qquad 2.12$$

Where function v could place to be utility indicator of representative tastes

From these models had the condition to be independent in choice for 3 cases.

The probability could apply in this research. The researcher took the theory to apply in the residential choice model for the samples in the research. From the related research studies found that the theory was suitable to use for the residential choice decision because each choice had interesting factors that were different in the choice decision.

2.2 Alternative theory of transportation and residential choice

2.2.1 Commuters' Mode and Route Choices

(Hsu & Guo, 2006) The analysis commuters' mode and route choices were named the hypothesis about 2 types of mode and route choice that meant to drive a car along the main road for ending in the central business district(CBD) and traveling by BTS to the central business district. The transportation in two types were defined to compare between expense for traveling and duration(time) for traveling. The analysis was categorized each parallel to compare in expenses and times for traveling from the residence to the central business district. under the hypothesis choice that passengers have got the most value in benefits according to calculation from the lower traveling cost. To specific for $B^{'}$ replace to the two-dimensional study area, and to specific X and O replace to the coordinate by taking x_1, x_2 were the residential locations and o_1, o_2 were the CBD locations which the distance for traveling on the road was $D(X,O)$ from the location X in residence to (CBD) for kication O that it could be in the equation as

$$D(X,O) = |x_1 - o_1| + |x_2 - o_2| \quad (x_1, x_2) \in B^{'} \quad 2.13$$

Moreover, to take v_L replace to the averaged speed of the traveling and f_L replace to the patrol expense for land traveling per a kilometer. C_0 replace to car parking fee in CBD center for each time.

For the parametric value of ss was more stable than $B^{'}$ which defining to $T_L(X)$ replace to the duration for traveling in round trip, and $C_L(X)$ replace to expense

for traveling as round trip from the residential location X to CBD location O . it could be in the equation as

$$T_L(X) = 2D(X,O)ss/v_L \quad \forall(x_1,x_2) \in B' \qquad 2.14$$

$$C_L(X) = 2D(X,O)ssf_L + c_0 \quad \forall(x_1,x_2) \in B' \qquad 2.15$$

To specific

Equation 2.14 was the equation that showed to time for traveling of all.

Equation 2.15 was the equation that showed to expense for traveling

For traveling by the rail transit(BTS and MRT), there were specified M replace to the number of rail transit lines where j_i replace to the number of rail transit stations, when $M = 1,..,M$ and take y_1, y_2 were the location of rail transit stations replace to S_{ij} then $j = 1,..,j$ was the distance for land traveling from the residence X to rail transit stations S_{ij} It could be in the equation as

$$D(X,S_{ij}) = |x_1 - y_1| + |x_2 - y_2| \qquad 2.16$$

$$for\ i = 1,2,\dots,M\ ; j = 1,2,..,j\ ; (x_1,x_2) \in B'$$

Then. To specific $L(S_{ij},O)$ relace to the distance for traveling from rail transit stations to CBD by taking v_{Ti} replace to the average speed of the rail transit. The $w_{S_{ij}}$ replace to rail temporarily parking time in every station from S_{ij} to CBD center, The h_i replace to the average headway of rail transit, and $f_{S_{ij}}$ replace to expense for traveling from rail transit station to CBD center. The $c_{S_{ij}}$ replace to the average of car parking fee.

From the previous data, there were about duration(time) for traveling and expense for traveling in round trip from the residential location X to the CBD center O which starting to travel from the residence to the rail transit station and then, traveling by rail transit to CBD center. It could be in the equation as

$$T_T(X, S_{ij}) = 2D(X, S_{ij})ss/v_L + 2wS_{ij} + h_i + 2L(S_{ij}, O)/v_{Ti} \quad 2.17$$

$$for\ i = 1,..,M\ \ and\ j = 1,..,j\ ;\ \forall(x_1, x_2) \in B'$$

$$C_T(X, S_{ij}) = 2D(X, S_{ij})ssf_L + c_{s_{ij}} + 2f_{s_{ij}} \quad 2.18$$

$$for\ i = 1,..,M\ \ and\ j = 1,..,j\ ;\ \forall(x_1, x_2) \in B'$$

To specific θ replace to time value, and g_o replace to the average expense for traveling from the rail transit station at CBD center to the work office which it revealed to expense for traveling from the residential location X to CBD center. It could be in the equation as

$$Z_L(X) = \theta \cdot T_L(X) + C_L(x)\forall(x_1, x_2) \in B' \quad 2.19$$

The expense for traveling from the residential location X to CBD by land traveling from the residence to rail transit stations and then, transit to the rail for continue to CBD center. It could be in the equation as

$$Z_T(X, S_{ij}) = \theta \cdot T_T(X, S_{ij}) + C_T(X, S_{ij}) + g_o \quad 2.20$$

$$for\ i = 1,..,M\ ; j = 1,..,j\ ; (x_1, x_2)\epsilon B'$$

To take $G^* = \min\{Z_L, Z_T\}$ was the expense for traveling at least by specified T^* was the duration(time) for traveling at least and C^* was the expense for traveling at least. The best route choice could be follow the equation 2.19 and 2.20.

2.2.2 Residential Location Choice Model

(Hsu & Guo, 2006)The analysis residential location choice of the household was created to consider in the maximize the household's residential utility which the factor was influent to choose the residential location choice (X). it contained with duration(time) for working(all member of the household) (t_{wi}) , duration for free time of all household member(available) (t_{Li}) , Expense for traveling in round trip ($C^*(x)$ and Duration(time) for traveling in round trip ($T^*(X)$). The location was from the residence (X) to (CBD) center, Income balance from rented fee and expense for traveling (I_i)

The number of household in residential location (X) was studied in observation about income recently before the present tough. To specific the area of household study ($HH_{i-1}(x)$) with the condition $\bar{T}$ refer to all time for each person which it was defined 1 month had got for 720 hrs. The w_i was the average income from only working per an hour. The $R_H(X)$ was rents fee per a sq,m. in the residential location (X).. The I_{Hi} was size of household area. The $\bar{t}$ was the frequency for traveling in average per a month, and $\bar{n}$ was the average number of passengers in the household, then it could be in the equation as

$$maxU_i = U(t_{Li}, C^*, T^*, I_i, HH_{i-1}X) \qquad 2.21$$

Limitations to(Subject to)

$$\bar{n} \cdot \bar{T} - t_{Li} - \bar{n} \cdot T^*(X) \cdot \bar{t} = 0 \qquad 2.22$$

$$w_i \cdot t_{wi} - I_i - R_H(X) \cdot I_{Hi} - C^*(X) \cdot \bar{t} \cdot \bar{n} = 0 \qquad 2.23$$

$$(x_1, x_2) \epsilon B'$$

The equation 2.21 was household's residential utility function.

The equation 2.22 was limited equation for the total time constraint of the household

The equation 2.23 was limited equation for the budget constraint of the household.

According to alternative theory of transportation and residential choice, the researcher took this theory to apply in this research which it was applied in the residential choice of research samples. The convenience for traveling was influent to the residential choice, so alternative theory of transportation and residential choice was suitable to adapt and apply in the research study.

In conclusion, the researcher could take the theory of Preferences and Selection Probabilities to be the theoretical research and the alternative theory of transportation and residential choice was applied in the residential choice model which studied to research samples. Then, the theory was developed to create the suitable model for the study.

2.3 Research Relates

For the residential location choice study, there were many kinds of the study in this research as follow

The residential location choice study by using stated preference method(SP) which was the simulating studies technique by creating the simulation for people to choose the residential choice decision in the order to check the circumstance for each of factors in the simulation that had changed as the result in the effects for each factor in the simulation. The research studies revealed that Patricio E. Pe´rez et al. (2003). had studied about Microeconomic formulation and estimation of a residential location choice Model : Implications for the value of time which had collected data by using the questionnaires about the defining simulation for people to choose the residence. The simulations were considered to types of household's traveling to percept in household members' traveling. For the simulating creation, there were defined traveling mode and expense for rent the residence for the household members to choose following to simulations. Income in each of simulations were categorized in various level such as

lower, middle, and higher of income level to study about the behavioral decision within assumptions that were related to the diverse income and it mentioned to exchange between the income and the residence in the simulations. For Jae Hong Kim et al.(2005) had studied about The Intention to Move and Residential Location Choice Behavior which the simulations were created for choosing by household member. The simulation 1 was the exchange trade- off between price of house and public transportation. The simulation 2 was the exchange trade- off between price of house and facilities in everyday life. Moreover, Gusti Ayu Andani et al.(2020) had studied about Exploring the role of toll road construction on residential location choice in the Jakarta, which this research study focused on the tollway construction with the entry payment that effected to the residential choice. The simulations were created for 3 choices of the choosing residence in this research. For example, the alternative 1 defined the hypothesis in the residential choice to be house A, for the alternative 2 defined the hypothesis in the residential choice to be house B, and the alternative 3 was the first of house. The simulations were included to these factors for create it. Jia Guo et al.(2020) had studied about Co-dependent workplace, residence and commuting mode choice: Results of a multi-dimensional mixed logit model with panel effects, this research focused on the city plan management for the density of population to be balance as the result in job vacancy and the residence in the city. The study was revealed to the effect of decision changes, the most of the satisfaction in the residential choice by household, work position and public transportation. The simulations were created in this research. For example, the alternative choice in the 1 of step was to choose between the residential relocation and career changes, then the sample must choose continually the choice of the alternative 2 for each in alternative 1. The alternative 2 was kinds of the transportation in choice such as car, rail transits, public bus, bicycle, and the walking.

According to the research study in the residential location choice by using stated preference method which was the technique to study for creating the simulation to choose by the research samples. The variable in household with lower income would choose the residence where was distant from the work office because the distant

residence's price was cheaper than the residence where was nearby the work office. In the other hand, the household with higher income would choose the residence by considering from the convenience for traveling, duration for traveling at least that they altered to pay for rents in the high price. The simulation had been adjusted the rate of income to be suitable for each person that was notice the behavior and the tendency for the decision that had changed in the variable according to the study of Patricio E. Pe´rez et al. (2003). Jae Hong Kim et al.(2005). and Jia Guo et al.(2020. The variables that were related to duration for traveling to work, or duration for traveling to school, and duration for traveling to shopping mall therefore, people choose the residence which they could spend in the shortest time for traveling to the place. Similarly, people considered to choose the residence where was nearby the work office for saving time in the traveling. People chose the residence where was nearby the shopping mall to rush in there for traveling. Also, the simulation had been created and adjusted the duration for traveling to other places in order to notice the behavior and the tendency for the decision that had changed following the duration for traveling that following the study of Patricio E. Pe´rez et al. (2003). Jae Hong Kim et al.(2005) and Jia Guo et al.(2020). The variables that were between related to the distance for traveling and the bus stop, the residence and the tollway entry payment, the distance that was far from the rail transits station, the distance that was far from the public bus stop, the distance that was far from the shopping mall. People had a tendency to choose the residence with nearby the facilities because there was convenient to travel from the residence to other places. Also, the simulation had been created and adjusted the distance for traveling in the variable to notice the behavior and the tendency for the decision that had changed for each person that following to the study of Patricio E. Pe´rez et al. (2003) Gusti Ayu Andani et al.(2020) and Jia Guo et al.(2020). The variables that were related to the residential price and residential charge for rents what people had a tendency to choose for buying the residence in the cheaper price definitely under the income. People decided to buy or rent the residence from the price at first , then they considered other factors follow in. The simulation had adjusted the residential price which the residence

with expensive price included to the convenience and facilities for the residents more than the residence with the cheap in price in order to notice the behavior and the tendency for the decision that had changed in the residential price context according to the study of Jae Hong Kim et al.(2005) Gusti Ayu Andani et al.(2020) and Jia Guo et al.(2020). The variables that were related to the expense for traveling from the residence to work office, and the expense for traveling to facilities of place. People had a tendency to choose the residence for save and remain in the expense for traveling at least due to they traveled for officially. The simulation had been adjusted the expense for traveling to work office, and the expense for traveling to facilities of place in order to notice the behavior and the tendency for the decision that had changed for each person following to the study of Jae Hong Kim et al.(2005) and Gusti Ayu Andani et al.(2020).The variables that were related to the convenient and facilitate place such as school, hospital, and shopping mall what people had a tendency to choose for buying the residence where is located nearby the convenient and facilitate place because they frequently traveled to there and it was convenient to get there for short. The simulation had been defined these places were or not in each simulation to notice the behavior and the tendency for the decision in the convenient and facilities place according to the study of Jae Hong Kim et al.(2005) และ Jia Guo et al.(2020). The variables that were related to the environment in the area of the residence , for example, the population density around the residence area what people had a tendency to choose for buying the residence where is located in the urban district more than sub urban as result to there were a lot of people to stay there. For these reason, the urban district was the economic center and there were many facilities for the living life such as shopping mall, etc,. The simulation had been defined the residential location in urban or sub urban to notice the behavior and the tendency for the decision in the buying residence for each person according to the study of Jae Hong Kim et al.(2005). The variables that were related to the residential revenue and found that people had a tendency to choose for buying the residence which they were able to pay in the lower tax for saving the expense. The simulation had been defined rate of tax payment to notice the behavior and the

tendency for the decision in agree of tax payment as follow to the study of Gusti Ayu Andani et al.(2020). The variables that were related to walking , and people had a tendency to choose for walking when they felt satisfied or comfortable in the way. The simulation had been categorized for 5 types; 1 Car, the important factors were the expense for traveling, the duration for traveling, and duration changes from the recent. 2 Rail transit, the important factors were the expense for traveling, the duration for waiting rail, and transportation method (sitting on seat or while standing) 3 public bus, the important factors were the expense for traveling, the duration for traveling, the duration for waiting buses, the duration changes from the recent, and transportation method (sitting on seat or while standing). 4 Bicycle, the important factors were the duration for traveling. 5 Walking, the important factors were the duration for traveling according to the study of Jia Guo et al.(2020)

For The residential location choice study by using revealed preference method(RP) which was the collecting data technique from people to buy the residence from residential location choice decision in the order to analyze the circumstance in the study about the behavior and factors as the result in the effects the residential location choice decision. The researcher had gathered relevant research in revealed preference method(RP) found that Patricio E. Pe´rez et al. (2003) had studied about Microeconomic formulation and estimation of a residential location choice Model : Implications for the value of time, which the research collected the general data from each household member and also the traveling behavior data. The research study of Jae Hong Kim et al.(2005) had studied about The Intention to Move and Residential Location Choice Behaviour, which the research was collected general data by using the questionnaire. The data was relevant to the factors that affected to relocation and the factors had been studied to the effects of relocation. Chaug-Ing Hsu et al.(2006) had studied CBD Oriented Commuters' Mode and Residential Location Choices in an Urban Area with Surface Streets and Rail Transit Lines., was different from the study of Patricio E. Pe´rez et al. (2003) and Jae Hong Kim et al.(2005), the study revealed about the residential choice model for the household member with two-dimensional space that related to

traveling choice and traveling routes. The simulation revealed to people chose to travel in the choice and route that they pay in a few of traveling expense. The simulator showed in the behavior for residential choice decision of the household what the study didn't assume about the land procurement or land for rents. The research didn't state in the route network in related area how they could decrease for duration in traveling. Moreover, the study was focus on especially study in the urban area where is the Central Business District (CBD) and stated for 2 kinds of the transportations such as the car and the rail transits but this study revealed to the population dispersion of the household residents who traveled from the residence onto the Central Business District (CBD) by the car and the rail transits. The study considered to the definition of the duration and budget for traveling to work. Carola de Groot et al.(2011) had studied about Intentions to Move and Actual Moving Behaviour in The Netherlands. , the research was collected data about the residential requirement and the data from the statistics office. The study categorized the samples for 2 groups ; the general person and the person who had the intention to move out from the residence first by collecting data from the questionnaire all in same. In the questionnaire, its were consisted of the factor what affected to the moving residence. Jonas De Vos et al.(2016) had studied, Travel mode choice and travel satisfaction: bridging the gap between decision utility and experienced utility. , The purposes of the study were to the agreement and the satisfaction in the traveling choice for the vacation. The data was collected from the people who stayed in the urban and sub urban area, and the general data from these people was taken to study within the factors for traveling choice such as; the car, rail transit, motorbike, and walking. Gusti Ayu Andani et al.(2020) had studied, Exploring the role of toll road construction on residential location choice in the Jakarta., this research was focus on the tollway that related to entry payment as result to the residents requirement. Furthermore, the general data and transportation data collection were in traveling choice, and the residents data and psychology data were categorized for 5 levels that detailed of its such as; the duration for traveling to work, the duration for traveling to new work office, public transportation system, the duration for traveling to

shopping mall, the duration for traveling to school, the duration for traveling to the convenient and facilities place, the duration for traveling from the house to the new residence, size of residence, the environment, the number of bedrooms, and the traffic condition. Jonas De Vos et al. (2020) had studied, Are young adults car-loving urbanites? Comparing young and older adults' residential location choice, travel behavior and attitudes., the data was analyzed for the residential location choice, and travel behavior and attitudes. The study was focus on the urban and sub urban which the first part of data was the general data by separating the household for lower, intermediate, and higher of the income level. In addition, the research had observed the attitude about traveling factors such as; the satisfaction for traveling by the car. The traveling with public transportation system, and the driving motorbike or walking. All of the aspects were detailed about traveling to work and relaxing.

According to the research study in the residential location choice by using revealed preference method which was the technique to study with the collecting data about the residential choice decision, found that the variables that were related to income had effected to moving out from the residence. People who was in the higher income are certain to give the importance for the moving residence and they would consider to the convenience and facilities in the living life at first. All of the research studies were coherence in this detail. The gender was the important factor in all of the research studies what it determined to be analyzed. As follow the research study of Carola de Groot et al.(2011) revealed that female had got the incentive to move the residence less than male. The research study was related to other research was age, and found that age had effected to the residential choice decision. If people were in the elder, the moving residence needs was also decreasingly. People who were without the nationality were frequently to move out from the residence more than other people. According to the study of Carola de Groot et al.(2011), age was in all model of the research. The variables had effected to the decision as reasonably that along to the education. For these reasons, people who were in the higher degree of education had affected to be quality of living life, so all research certainly defined the education to be

the variable in the research in order to research circumstance. People with higher education were cause of the moving the residence. According to Carola de Groot et al.(2011), the number of household member were huge that had a tendency to decide as differently from the household member were a few in. All research study had showed the result to the huge member in the household would choose the residence with the large size of space. The number of cars was found that the residential location choice had effected to own cars. People who stayed in sub urban had got many cars for own due to the transportation in sub urban was not completely in the service of the area and in result that transportation was not available for people, which was related to all the research study. Price of the residence was the important factor for the residential choice because people had got income for limit what they decided to choose the residence with the price that was potential to buy enough. The research was found that people who had got in the lower income would buy the residence where was located around the sub urban and they traveled to work in the urban area. From the research study of Chaug-Ing Hsu et al.(2006) stated to people who worked at CBD stayed distant from work office and they chose to travel into work office by rail transit lines, which was related to all the research. The duration for traveling to work was the important variable what all research stated to the residential choice decision. People chose the residence from the convenience for traveling to work or relaxing according to Jae Hong Kim et al.(2005) Jonas De Vos et al.(2016) and Gusti Ayu Andani et al.(2020). Furthermore, Chaug-Ing Hsu et al.(2006) found that rail transit system has effected to mode choice and residential location which people who worked in the urban would choose to stay around the sub urban, and they traveled to work by rail transit from the distant line to central line. Meanwhile, people who worked in the urban would travel to work by private cars. For the expense for traveling, people considered in the payment at least for traveling route according to Chaug-Ing Hsu et al.(2006). There were many choices for traveling from the residence to other place such as; private car, rail transit, and public bus.,etc There were expense and convenience as differently for each mode choice according to Gusti Ayu Andani et al.(2020). Moreover, Jonas De Vos et al.(2020) found

that public bus fee was high rate and long duration for traveling as result that people chose to travel by private cars. The population density was found that people would choose the residence with nearby work office due to the convenience for traveling to work following to Jae Hong Kim et al.(2005), In addition, Chaug-Ing Hsu et al.(2006) found that there was the population density in rail transit area and station because people needed the residence with the convenience for traveling that affected the residence price was high rate. Size of the house or the number of bedrooms, people needed for the huge space because they could have to do activities in the space for the convenience. For the condominium, if there were many household members, they needed more bedrooms because people wanted the privacy in the relaxing chance following Jae Hong Kim et al.(2005). The variable that related to the residential license. People who were owned residential license had the tendency to stay for permanent while the rents stay for temporarily and frequently moving out according to Carola de Groot et al.(2011) and Gusti Ayu Andani et al.(2020). The variable that related to public transportation. People were featured to choose for the convenience in traveling and saved for the expense. The study of Chaug-Ing Hsu et al.(2006), found that the public transportation made the result in the dispersion of household who worked in the urban or central district to travel by private cars and rail transit lines. People considered in limitations of duration and budget in traveling to work.

For the psychology study of Gusti Ayu Andani et al.(2020), was categorized the satisfaction for 5 levels, and found that the factors were effectively such as; the duration for traveling to work, the duration for traveling to new work office, public transportation system, the duration for traveling to shopping mall, the duration for traveling to school, the duration for traveling to the convenient and facilities place, the duration for traveling from the house to the new residence, size of residence, the environment, the number of bedrooms, and the traffic condition. Moreover, Jonas De Vos et al.(2020) had observed the attitude about walking which was categorized as the satisfaction for driving cars, traveling by public transportation, driving the motorbike and walking which 4 aspects were detailed about traveling to work and relaxing. The study found that teenager chose

to stay in urban district and the study results for traveling was showed to 5 types of traveling, for example, 1. Traveling by the car which consisted of the important factors was location in sub urban and the satisfaction for traveling by the car was good. Moreover, male and couple in marriage were in the good of attitude for traveling by the car. 2. Traveling by the public bus which consisted of the important factor was the good satisfaction for walking on footpath. 3 .Traveling by rail transit which consisted of the important factors was location in urban district. Moreover, there was disagree of attitude for traveling by cars, but the strongly agree of attitude for walking and high education. 4. Traveling by the motorbike which consisted of the important factors were female and education in university degree, and there was strongly agree of attitude to traveling by motorbike. 5. Walking on footpath which consisted of the important factors was location of the residence in the urban, low degree in education, and lower income that related to the study of Jonas De Vos et al.(2016) found that the elder person had a good attitude to traveling by cars. The people who stayed in sub urban had good attitude to traveling by public bus. People were strongly agree of the attitude for traveling by motorbike and public transportation because of spending time for traveling in short. Walking was found that when people were older, they had a good attitude to walking more.

The research study could apply to create the model for using in this research, then there was the suitable model to educate the behavioral needs for the residential location choice in Bangkok.

Table 2 The comparison of the research studies

Author(s) and date	Case study	Data analysis methods	Explanatory variable
Patricio E. Pe´rez et al., 2003	Chile	Simultaneous and unique estimation	Income The number of household members The number of cars Duration for traveling Distance for traveling Expense for rents
Jae Hong Kim et al., 2005	Oxfordshire, UK	nested logit model	Price of residence Duration for traveling Expense for traveling Location in urban or sub urban Population density Educational institution Types of residence The number of bedrooms The number of members Income remaining from tax payment
Chaug-Ing Hsu et al., 2006	Taipe	simulation method	Duration for traveling Population density Expense for traveling
Carola de Groot et al., 2011	Netherlands	logistic regression models	Status Income Educational level Nationality

Table 2 (Continue)

Author(s) and date	Case study	Data analysis methods	Explanatory variable
			Owned license Convenience and facilities
Jonas De Vos et al., 2016	Ghent, Belgium	Linear regression models	Income Occupation Educational level The number of household members The number of cars Expense for traveling Duration for traveling Location in urban or sub urban Travel vehicle type
Jia Guo et al., 2020	Shenyang, China	Mixed Multinomial Logit model	Right of ownership Price of residence Residential size Duration for Convenience Location in urban or sub urban Workplace Employment type
Gusti Ayu Andani et al., 2020	Jakarta, Indonesia	Mixed logit model	Expense for rents Expense for traveling Distance from the accommodation to the expressway The number of household members

Table 2 (Continue)

Author(s) and date	Case study	Data analysis methods	Explanatory variable
			Vehicle type
			Types of residence
			Right of ownership
			Original residence period
Jonas De Vos et al., 2020	Ghent, Belgium	Binary logistic regression model	Income
			Status
			Educational level
			Vehicle type
			Travel frequency

Source : Data collection by the researcher

CHAPTER 3

RESEARCH METHODOLOGY

In this research, the research methodology was relevant the research objective as follow

3.1 The research methodology was to study the influencing factor that affected to the decision between the residential choice for purchasing and renting condominium by using Revealed Preference (RP)

This method was the data observation from condominium residents who were also owned purchaser and rents in Bangkok. The researcher had operated in procedure as follow to these steps;

1.1 Identifying population and samples

1.2 Research instrumentation

1.3 Data collection

3.1.1 Identifying population and samples size

The research study was survey research by using the questionnaires that informants who were rustic, and they lived in Bangkok. It was primary data. The researcher determined to study with the own purchaser and rents condominium to be the samples. Moreover, the data were collected from related agencies, the journal and the research.

1. Sample selection

The sample selection in this research was proportional sampling and the sample was specified in districts where are along to rail transit lines in Bangkok.

2. sample size determination

As the population size was huge and the number of population was inaccurate, so the sample size could compute from the inaccurate population formula by using by specifying the level of confidence at 95%

$$n = \frac{P(1-P)Z^2}{E^2} \qquad 3.1$$

where n refers sample size

E refers precision of estimate at 5%

Z refers Z value is 1.96

P refers variance data that defining in the highest level at 0.50

The condominium purchasers were used to be non-registered population first or nowadays, and they were specified the deviation for estimation a level of confidence at 95%. To calculate sample size be used;

$$n = \frac{P(1-P)Z^2}{E^2}$$

$$n = \frac{(0.50)(1-0.50)(1.96^2)}{(0.05^2)}$$

$$n = 384.16 \text{ samples}$$

According to the calculating sample size, the samples were 400 samples in this research.

3. Sampling method

The sampling used in this research was single stage sampling. The people who stayed in the condominium with nearby the rail transit stations such as green line, orange line, Silom line, Blue line, Purple line, and Airport Rail Link were determined as the samples, and the condominium was located far from the station around 500 meters. Furthermore, there was another random sampling from the people who were condominium purchaser and rents condominium with distant from the rail transit stations at least a kilometer or more

3.1.2 Research Instrumentation

The instrument used in this research was the questionnaire consisting of 2 parts;

Part 1 Personal information of the respondents.

Part 2 The behavior for the residential choice by Revealed Preference method (RP)

2.1 Traveling to work office information

2.2 Residence information

2.3 Residential Location information

3.1.3 Data collection

Data collection were 2 types in. this research as follow; Secondary data which were from government councils as report annual or related research. Primary data which were from the questionnaire of the 2 sample groups as follow;

1.The samples who bought condominium by own for 200 samples. To categorized as follow;

1.1 The samples who were owned condominium with nearby the rail transit station for 100 samples

1.2 The samples who were owned condominium out of the rail transit station for 100 samples

*2.*The samples who rented condominium for 200 samples

2.1 The samples who rented condominium with nearby the rail transit station for 100 samples.

2.2 The samples who rented condominium out of the rail transit station for 100 samples

3.2 The research methodology was to study the influencing factor that affected to the decision between the residential choice for condominium where is located nearby and distant from the rail transit stations by using Revealed Preference (RP)

This method was the data observation about the residential location choice for the condominium type and people who decided to choose the residence in the condominium space where was located nearby and distant from the rail transit stations. The researcher had operated in procedure as follow to these steps;

3.2.1 Identifying population and samples

3.2.2 Research instrumentation

3.2.3 Data collection

3.2.1 Identifying population and samples

The research studies was survey research by using the questionnaires that informants who were rustic, and they lived in Bangkok. It was primary data. The researcher determined to study with the residents who stayed in the condominium with nearby and distant from the rail transit station as the samples. The research methodology was also referred to sample selection and sample size determination in part 1. The samples were 400 samples for the study.

1. Sampling method

The sampling used in this research was single stage sampling. The people who stayed in the condominium with nearby the rail transit station such as green line, orange line, Silom line, Blue line, Purple line, and Airport Rail Link were determined as the samples, and the condominium was located far from the station around 500 meters. Furthermore, there was another random sampling from the people who were condominium purchaser and rents condominium with distant from the rail transit stations at least a kilometer.

3.2.2 Research Instrumentation

The instrument used in this research was the questionnaire consisting of 3 parts;

Part 1 Personal information of the respondents.

Part 2 The behavior for the residential choice by Revealed Preference method(RP)

2.1 Traveling to work office information

2.2 Residence information

2.3 Residential Location information

Part 3 The satisfaction level for the residential choice and transportation.

3.3 Revealed Preference method(RP)

The behavioral study for the residential choice decision of non-registered population by using the Revealed Preference (RP). This technique was the data observation about the residential choice decision in the defining simulation what people had already chosen the residence completely. The data was collected from the informants that related to factor about personal aspects and residential choice by categorized for 3 factors such as; 1 The factor was about traveling to work . 2. The factor was about the residence 3. The factor was about the residential location. The data was collected from 400 of research samples and the data was analyzed as follow;

1 . The analysis of the residential choice decision for condominium by using Binary Logit Model which was determined for 2 choices were the renting condominium decision and the buying condominium for own.

2 . The analysis of the residential location choice decision for condominium by using Binary Logit Model which was determined for 2 choices were the condominium where was located nearby and distant from the rail transit stations.

The research procedure with revealed preference (RP) had operated following these steps;

3.3.1 Concept and theory of the satisfaction for the residential choice decision in the research

3.3.2 Qualification test of Independence of Irrelevant Alternatives(IIA))

3.3.3 Model constructing Process

3.3.4 Data analysis

3.3.1 The concept and theory of the satisfaction for the residential choice decision in the research

The method was taken from the related research and applied for using with the related theory about the residential and location choice decision which was in the highest of satisfaction. It could be maximize the residential utility equation as follow;

$$\text{Max}\, U = U(T_r, T_t, C_t, I_n, F_c) \qquad 3.2$$

Limitations;

$$T - T_r - T_w - T_t(X)f = 0 \quad 3.3$$

$$w_N T_w - I_n - R_h - C_t(X)f = 0 \quad 3.4$$

To determine

T_r instead of Time for relaxing (mins)

T_t instead of Time for traveling from the residence to office (mins)

C_t instead of Total expenses for traveling (Bath)

I_n instead of Balance income from expenses traveling and the residence (Bath)

F_c instead of Convenience and facilities

T instead of Total duration(mins)

T_w instead of Total works(mins)

f instead of Frequency traveling (Time)

w_N instead of Wage per an hour (Bath)

R_h instead of expenses including to the residence (Bath)

Then, it could be in Lagrangian Function as follow;

$$L = U(T_r, T_t, C_t, I_n, F_c) + \lambda_1(T - T_r - T_w - T_t(X)f) + \lambda_2(w_N T_w - I_n - R_h - C_t(X)f) \quad 3.5$$

To specific in Partial derivative L =0

$$\frac{\partial L}{\partial T_r} = L_{T_r} = 0 \quad 3.6 \quad ; \quad \frac{\partial L}{\partial F_c} = L_{F_c} = 0 \quad 3.10$$

$$\frac{\partial L}{\partial T_t} = L_{T_t} = 0 \quad 3.7 \quad ; \quad \frac{\partial L}{\partial \lambda_1} = L_{\lambda_1} = 0 \quad 3.11$$

$$\frac{\partial L}{\partial C_t} = L_{C_t} = 0 \quad 3.8 \quad ; \quad \frac{\partial L}{\partial \lambda_2} = L_{\lambda_2} = 0 \quad 3.12$$

$$\frac{\partial L}{\partial I_n} = L_{I_n} = 0 \quad 3.9$$

To find the last unit of (Marginal Utility)

$$\mathrm{MU_{T_r}} = \frac{\partial \mathrm{U}}{\partial \mathrm{T_r}} = \mathrm{U_{T_r}} \quad 3.13 \quad ; \mathrm{MU_{I_n}} = \frac{\partial \mathrm{U}}{\partial \mathrm{I_n}} = \mathrm{U_{I_n}} \quad 3.16$$

$$\mathrm{MU_{T_t}} = \frac{\partial \mathrm{U}}{\partial \mathrm{T_t}} = \mathrm{U_{T_t}} \quad 3.14 \quad ; \mathrm{MU_{F_c}} = \frac{\partial \mathrm{U}}{\partial \mathrm{F_c}} = \mathrm{U_{F_c}} \quad 3.17$$

$$\mathrm{MU_{C_t}} = \frac{\partial \mathrm{U}}{\partial \mathrm{C_t}} = \mathrm{U_{C_t}} \quad 3.15$$

Alternative Choice Model revealed to the behavioral correlation for the residential choice between owner or rents residences and other factors by using the utility. The hypothesis was owner and rents chose the residential location to be the highest for their satisfaction. The measurement of residential location satisfaction could be in quantitative with utility function that contained with deterministic component and random component. To specific the utility of residential choice method was functions about the residential choice utility function. For the measurement in the satisfaction, the hypothesis was owner and rents residential choice had perceived about the residential location completely and the residential buyer used decision role to choose the residential location in the highest of satisfaction. For these reasons, the utility was definitely to each location and it could be an utility function as deterministic component follow the equation 3.18

$$V_i = f(\beta_k, X_k) \quad 3.18$$

An equation could be in 3.18 as liner equation in 3.19

$$V_i = \sum_{k=1}^{k}(\beta_{ik}, X_{ik}) \quad 3.19$$

where V_i means to the alternative utility of i

β_{ik} means to the coefficient variable k of the alternative utility i

X_{ik} means to the independent k of the alternative utility i

k means to the ordinal number 1,2,3,…,K

K means to all of the variables that considered in utility function

The utility function contains with random utility component including to the hypothesis what person could not know about residential location information for each type completely, so the utility rate could not been specific as accuracy that effect to the deviation in model. The utility function contained to a part of deterministic and random as Stochastic in equation 3.20

$$U_m = V_{in} + \varepsilon_{in} \quad 3.20$$

where U_m means to the satisfaction of n to the location i

V_{in} means to *(*Deterministic Component*)*

ε_{in} means to *(*Random Component*)*

3.3.2 Qualification test of Independence of Irrelevant Alternatives(IIA)

For the alternative model, there was fundamental hypothesis for each alternative should be independent. Its depend on choice sets offering only for choose and to be independent for other choice what its were not an independent of irrelevant alternative whether set of alternative was equivalent somehow. The possible proportion was at i to j constantly. The IIA validity was able to use Hausman Test as follow calculating steps;

1. Model precision by using data all of choice set j, the alternative was β_u (Vector of coefficient that can estimate in the value.) and Ω_u (Covariance Matrices that can estimate in the value)

2 . Model precision by choice set selection sorted out more or 1 alternative. The β_r was (Vector of coefficient to be valuable) and Ω_r (Covariance Matrices that can estimate in the value) to estimate the simulation by selecting from Choice Set more than 1 or 1 choice to be was β_u (Vector of coefficient that can estimate in the value.) and Ω_u (Covariance Matrices that can estimate in the value)

3.To take the coefficient according to above 2 steps to calculate in H_{IIA}

$$H_{IIA} = (\beta_r - \beta_u)'(\Omega_r - \Omega_u)^{-1}(\beta_r - \beta_u) \qquad 3.21$$

The H_{IIA} was enumerated in Ch-Square, so H_{IIA} was calculated to compare with crisis in Chi-Square$(X^2$ at degree of freedom as equal as the amount of the coefficient (β_u). There was the distribution in Chi-Square(X^2), so H_{IIA} was equal as (β_u)

3.3.3 Model constructing Process

1 . Variables coefficient estimation. The parametric estimation with the utility function in Logit model contained with many estimating methods. The most popular method for estimate coefficient was Maximum Likelihood(ML) which the principle of analysis by using Maximum Likelihood that the number of all population who choose the residence was n persons and population who were at n, decide to choose the residence in choice. So the probability of all population in choice I could be in the equation as the probability function as (Likelihood Function)

$$L = \prod_{m=1}^{N} \prod_{i \epsilon c_m} P_n(i)^{yim} \qquad 3.22$$

when $\prod$ was the multiple of ordinal (Product Operator) such as *1*,2,3

L was the probability function

$P_n(i)$ was the probability what people choose the residence n for choice i

y_{im} was equal 1 when the residents n choose the residence i , and the others was equal 0

c_{im} was sets of all residential choice mode that considered

According to equation 3.2 the probability had changed along to the parametric β_{ik}. the parametric estimation with this method for the parametric findings β_{ik} that made the probability function get the maximum value. The finding maximum value could make by the derivation, so the equation was changed in Logarithm Function to be simplified for derivative findings that calling Log Likelihood Function(LL) . it could be an equation as;

$$LL = \log(L) = \sum_{n=1}^{N} \sum_{i \varepsilon c_m} y_{im} \log\left(P_n(i)\right) \qquad 3.23$$

To find the maximum value of log function according to derivation compare the variable in equation as;

$$\frac{\partial_{LL}}{\partial \beta_{ik}} = 0 \qquad 3.24$$

where k = 1,2,3,…,K

Using the numerical Method to find the maximum value of Log function with Newton-Raphson method what it was repeat process (Iterations). To find the point reach into the circumstance. To stop the repeat process when the convergent rate of each variables were less than the tolerance.

2. Model Validity Test the model was verified in the validity before model was taken to explain the behavior in residential choice. It was categorized for 2 levels: Internal Validity and External Validity.

The Internal Validity Test

1. The significant in the coefficients test could define the null hypothesis in the main hypothesis that $H_0: \beta_{ik} = 0$, and neglect the main hypothesis when the variable influent to the model in significant level at 95%

$$H_0: \beta_{ik} = 0$$

$$H_i: \beta_{ik} \neq 0$$

The variable test should verify with T-Test was

$$t_{N-k,\frac{\propto}{2}} = \frac{\beta_{ik}}{\sqrt{|V(\beta_{ik})|}} \quad 3.25$$

When $t_{N-k,\frac{\propto}{2}}$ refer to t that is independent value as N-K in significant level at 95%

β_{ik} คือ The parameter value of the variable k of utility equation

$V(\beta_{ik})$ คือ Variance β_{ik}

2. Goodness of Fit Test was the congruence verification of the model to explain the behavior in residential choice. The measurement was referred from Likelihood Ratio Index, ρ^2) could be in the equation as follow;

$$\rho^2 = 1 - \frac{LL(\beta_{ik})}{LL(0)} \quad 3.26$$

When $LL(\beta_{ik})$ refer to Log Likelihood from the coefficient estimation.

$LL(0)$ คือ Log Likelihood in case all of the parameter is equal as 0

(Train, 2002) The index of congruence was 0 to 1 if ρ^2 was reach to 0, the model could not use to explain about the behavior in residential choice as accuracy. But

ρ^2 was equal 1 , the model could use to explain about the behavior for residential choice. The ρ^2 was accepted at 0.20 of more level.

3 . The coefficient of marks, For the front of coefficient revealed to the influence in variables has effected to the model, and the coefficient in positive refer to the relation in variables and model were the same in the variation. But the negative coefficient refer to the relation of variables and model were inverse.

External Validity Test

The external validity was the evaluating method for the valid and precise of the model for estimating about the individual behavior by comparing with predicted outcome and the real outcome that its were from the observation or the analyzing based data to verify in the valid of Percent Correctly Estimated, could be in the equation as;

$$\%Correct = \sum_{n=1}^{N} \frac{W_n}{N} \qquad 3.27$$

When W_n refer to sample at n to choose in pattern i

N refer to All of the samples

3. Elasticity of Choice was the index that related to proportion choice changes when the variable value in the model had changed. It could explain to the influence of each variable that effected to the residential choice behavior. The elasticity of choice i and people who decide in n when comparing to variable k . It could be written to the equation as;

$$E_{x_{jnk}}^{P_n(i)} = \frac{\partial P_n(i)}{\partial X_{jnk}} \cdot \frac{X_{jnk}}{P_n(i)} \qquad 3.28$$

When $E_{x_{jnk}}^{P_n(i)}$ refer to the elasticity of choice I when comparing to variable X_{jnk}

$P_n(i)$ refer to the proportion of the choice

3.3.4 Data Analysis

1. Descriptive Analysis

The research had been studied and analyzed the data from questionnaires by respondents who were the target group of the research: owns and rents condominium. The statistics method were the average, the standard deviation, the relative Max-Min of the respondents.

The average of satisfaction about the residence and transportation system 5 point of the level.

5 refers to Strongly agree

4 refers to Agree

3 refers to Neutral

2 refers to Disagree

1 refers to Strongly Disagree

The interpretation of absolute criteria could be categorized as follow to the level of the satisfaction;

4.50-5.00	refers to	Very High Satisfaction
3.51-4.50	refers to	High Satisfaction
2.51-3.50	refers to	Moderate Satisfaction
1.51-2.50	refers to	Low Satisfaction
1.00-1.50	refers to	Very Low Satisfaction

3.4.2 Quantitative Analysis

The research had been studied and analyzed the data about an behavior in revealed preference and the data in the simulation for the decision used stated preference.

1. Binary Logit Model The theoretical behavior in the residential choice decision model had the hypothesis from the people who decided to choose the location that they were the most satisfied with the location. So, the probability for location choice I, if the utility of I was more than the another choice utility.

The analysis regression was specified the dependent variable to be the continuous variable or quantitative data, but some case of the dependent variable was the qualitative variable. The variable had 2 values that called Binary choice what the value were only 0 or 1. For analysis model, the purpose was seeking the probability in 2 situations could be 0 or 1

Probability was 0 to 1. There were usually 3rd model to use for the estimation 1. Linear Probability Model 2nd . Probit Model 3rd . Logit Model The estimation in Linear Probability Model was not suitable for the estimating model, but according to the study found Probit and Logit Model was able to use in case of the dependent variable to be Binary and MLE (Maximum Likelihood Estimation was used for the estimating coefficient in the model with the conditions as follow

1 . The dependent variable should be Binary Response and the independent variable could be Dummy Variable /Interval/Ratio Scale

2.The average of the deviation is at 0 $[E(\varepsilon_i) = 0]$

3.The error is not related for each other $[Cov(\varepsilon_i \varepsilon_j) = 0)$

4.The independent variable and the deviation are independent of each other.

5.The independent variable is not related for each other

For the analysis, the model was categorized for 2 types; Probit and Logit Model was different about the specified deviation. Probit Model was specified the deviation to be normal distribution while Logit Model was specified the deviation to be logit distribution.

General form in the Model

$$prob(y_i = 1|x) = F(x_i\beta) \qquad 3.29$$

Probit Function to

$$prob(y_i = 1) = \Phi\left(\frac{x_i^{'}\beta}{\sigma}\right) = \int_{\sigma}^{x_i^{'}\beta} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{Z^2}{2}\right) dz \qquad 3.30$$

Logit Function to

$$prob(y_i = 1) = \frac{e^{\beta^i x}}{1+e^{\beta^i x}} \quad 3.31$$

The model choice criteria for the analysis study by choosing the model which was showed the lowest point in AIC. The model was the best in evaluation. Akaike. (1973) presented the criteria of AIC selection which was created from the variant estimation of Kullback leibler Information between the real model and the suitable model with the validity. When the sample was large size, the selection by AIC was the lowest value for use that could explain for the dependent variable. The effective result of AIC selection was good when the sample size was a large due to the error was effected to the more independent variable. It could be in the equation as

$$\mathrm{AIC} = \mathrm{n}.\ \mathrm{In}\left(\frac{\mathrm{SSE}}{\mathrm{n}}\right) + 2\mathrm{p} \quad 3.32$$

where n was The sample size

SSE was The deviation of exponents(Squared) for the regression

p was the parametric of the regression in model

In was Log based of e

3.4 The research methodology was to study the influencing factor that affected to the decision between the residential choice for condominium where is located nearby and distant from the rail transit stations by using Stated Preference (SP)

This method was the data observation from non-registered population who didn't buy or get the condominium own in Bangkok. This technique was created the simulation that referred to the residential choice with nearby and distant from rail transit stations. The researcher had operated in procedure as follow to these steps;

3.4.1 Identifying population and samples size

3.4.2 Research Instrumentation

3.4.3 Data Collection

3.4.4 Stated Preference (SP)

3.4.5 Fractional Factorial Designs

3.4.6 Decision in the simulation

3.4.7 Data analysis of Multinomial logistic regression (MLR)

3.4.1 Identifying population and samples size

The research studies was survey research by using the questionnaires that informants who were rents condominium with nearby and distant from rail transit stations, and it was primary data. Moreover, the data were collected from related agencies, the journal and the research.

1. Sample selection

The sample selection in this research was proportional sampling and the samples were 200 samples by specified in districts where are along to rail transit lines in Bangkok.

2. Sampling method

The sampling used in this research was single stage sampling. The samples were random from non-registered population who stayed in the condominium with nearby rail transit stations. The condominium was located at least 500 meters from rail transit stations. Moreover, there was another random sampling from non-registered population who stayed in the condominium with distant from the rail transit stations at least a kilometer or more

3.4.2 Research Instrumentation

The instrument used in this research was the questionnaire consisting of 2 parts;

1. The simulation 1 with the condition in the usable area
2. The simulation 2 with the condition in the budget for buying the residence

3.4.3 Data Collection

The data collection was primary data which were from the questionnaire of the 2 sample groups

1. The samples who rented condominium with nearby the rail transit

stations for 100 samples.

2. The samples who rented condominium with distant from the rail transit stations for 100 samples

3.4.4 Stated Preference (SP)

This technique was to study about the behavioral for residential choice decision of non-registered population in Bangkok case study condominium by Stated Preference (SP) which it could be created 8 simulations and alternative choices for the people who were not used to buy and get condominium for own, to choose for buying condominium with individual decision for any situation. The data was taken to analyze in the statistical method as follow;

1. The analysis for condominium choice decision by using Multinomial logistic regression (MLR) in the simulation 1 with condition for 1 bedroom and size of room space 29 sq.m,. There were variables such as; price of condominium, duration for traveling, expense for traveling, and income which were taken to created in 8 simulations. The condominium choice was referred to the condominium with nearby and distant from rail transit stations

2. The analysis for condominium choice decision by using Multinomial logistic regression (MLR in the simulation 2 with condition of condominium price for 3,000,000 bath per a room. There were variables such as; size of room space, distance for traveling to shopping mall, fitness center or swimming pool, and the number of bedrooms which were taken to created in 8 simulations. The condominium choice was referred to the condominium with nearby and distant from rail transit stations

Stated Preference (SP) could be taken to apply in the research related to the individual decision for any situation due to the agencies has simulated about the interesting of people before operating to launch the final policy to predict the achievement of policy and the project of real-estate investment later.

3.4.5 Research Designs in Fractional Factorial Designs

The method for testing that is not necessary to define all conditions in the simulation about the value changes due to the number of operation is excessive as

result to it could not operate continually. Because of the condition of the estimation, the estimating circumstance is not precise as full factorial in theoretical. In the other hand, the full factorial test show the worse outcome more than Fractional Factorial Designs because it is difficult to control the factor and to effect in an error. So the researcher should test with Fractional Factorial Designs in case of many factors are. Moreover, the stat expert found there are some main effects and interaction that are important. The ordinal of interaction is increasingly but the significant is also decreasingly. For the reason, the researcher adjust to decrease the size of population in the test.

Table 3 The ratio of Main effects result per the number of Effects

The number of Main effects	The number of Interaction	The total of Effects	The percentage of Main effects
1	0	1	100.0
2	1	3	66.7
3	4	7	42.9
4	11	15	26.7
5	26	31	16.1
6	57	63	9.5
7	120	127	5.5
8	247	255	3.1
9	502	511	1.8
10	1013	1023	1.0

Source : http://www.geocities.ws/chalong_sri/Fract_DOE.htm(2563)

In this research studies, the researcher has managed the data in the State Preference questionnaire to be Fractional Factorial Designs Half factorial design (2^{k-1}) designs The simulation contained with 4 variables and the level of variables were high and low. So there were categorized for 8 simulations as follow;

Table 4 The simulating designs

Experiment No.	Factor 1	Factor 2	Factor 3	Factor 4
1	-1	-1	-1	-1
2	+1	-1	-1	+1
3	-1	+1	-1	+1
4	+1	+1	-1	-1
5	-1	-1	+1	+1
6	+1	-1	+1	-1
7	-1	+1	+1	-1
8	+1	+1	+1	+1

Source : http://www.geocities.ws/chalong_sri/Fract_DOE.htm(2563)

Table 5 Variables in simulation for 1 room with 29 Sq.m.

Variable	Detail	Level	Simulation
Price	Condominium and residence price (Bath)	4,350,000 2,900,000 2,400,000 1,900,000	SP 1
Duration for traveling	Duration for traveling from residence to office (Mins)	5 20 40 90	SP 1
Expense for traveling	Expense for traveling that including to travel from residence to office (Bath)	23 59 54 64	SP 1
Income	Income or salary that receiving per monthly (Bath)	35,000 55,000	SP 1

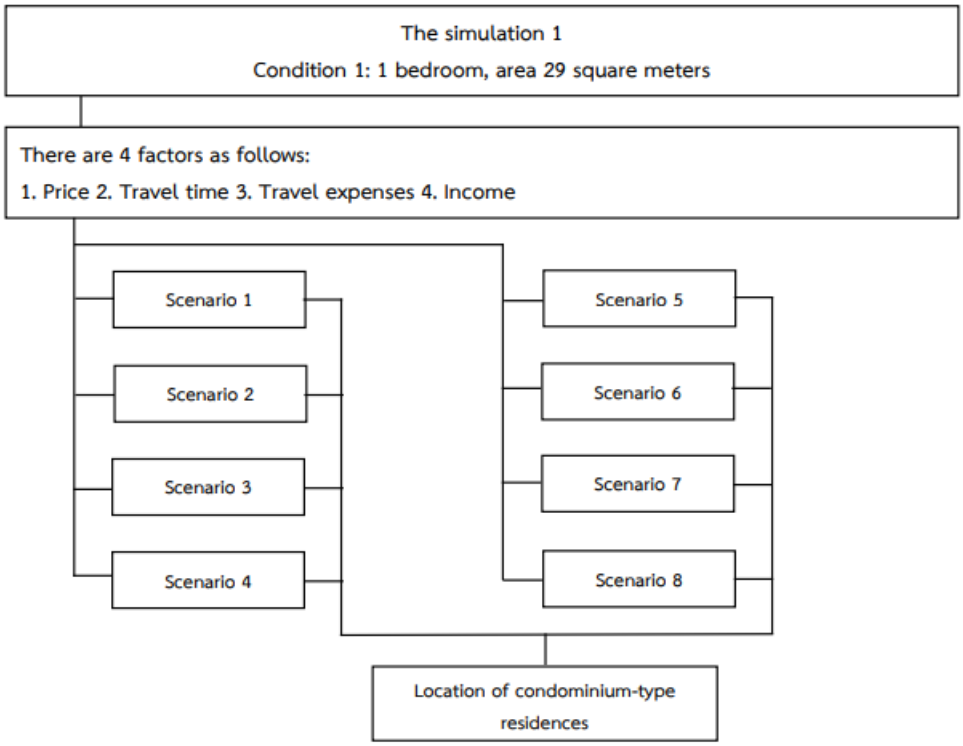
Source : Designed by the researcher

Table 6 Variables in simulation for price 3,000,000 Bath per room (Apartment)

Variables	Detail	Level	Simulation
Size	Size and area of the residence (Sq.m.)	20 30 35 46	SP 2
Distance from shopping mall	Distance for traveling to shopping mall (KM.)	0.5 1.0 4.0 6.0	SP 2
Fitness center and Pool	Swimming pool, Fitness and sport center in the project (N/A)	1 0	SP 2
Bedroom	The number of bedrooms (Room)	0 1 2	SP 2

Source : Designed by the researcher

3.4.6 Decision in the simulation



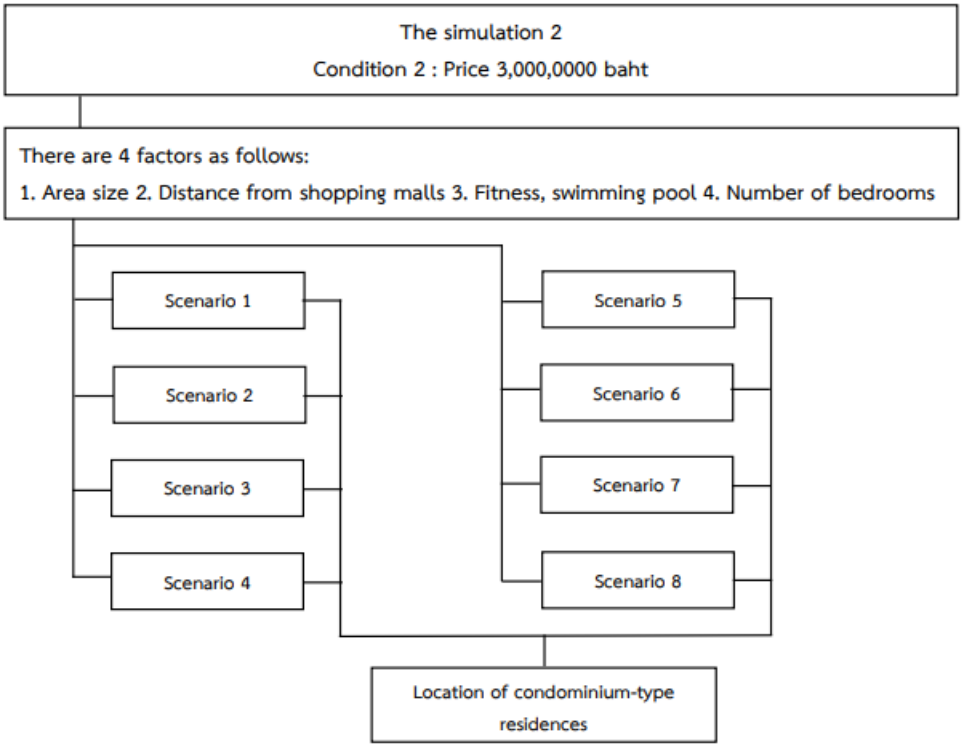


Figure 5 The component of the decision in simulations

Picture 5 showed the procedure of the simulating creation for the simulation 1 with condition for 1 bedroom and size of room space 29 sq.m,. and the simulation 2 with condition of condominium price for 3,000,000 bath per a room as steps;

1 . The simulation 1 with condition for 1 bedroom and size of room space 29 sq.m,. There were 8 simulations to choose for one which the choice also contained with the condominium where was located nearby and distant from rail transit stations. For each choice was contained with 4 factors to choose such as; price of condominium, duration for traveling, expense for traveling, and income. The factors had changed along to each simulation. The informants answered for all in simulations.

2. The simulation 2 with condition of condominium price for 3,000,000 bath per a room. There were 8 simulations to choose for one which the choice also contained with the condominium where was located nearby and distant from rail transit stations. For each choice was contained with 4 factors to choose such as; size of room space,

distance for traveling to shopping mall, fitness center or swimming pool, and the number of bedrooms. The factors had changed along to each simulation. The informants answered for all in simulations.

3.4.7 Dara Analysis with Multinomial logistic regression (MLR)

The model had 2 or more the residential choice. It was estimation to seek the probability what the sample would choose in the simulating choice. The probability depended on the other independent variable. The research created the simulation for the respondents choose the residence as condominium. The condominium nearby rail station, The condominium far from rail station, and no choosing for the condominium. The probability could present to be the equation as follow;

$$p_{i1} = \frac{1}{1 + \exp(\beta_{12} + \beta_{22}x_i) + \exp(\beta_{13} + \beta_{23}x_i)}, \quad j = 1$$

$$p_{i2} = \frac{\exp(\beta_{12} + \beta_{22}x_i)}{1 + \exp(\beta_{12} + \beta_{22}x_i) + \exp(\beta_{13} + \beta_{23}x_i)}, \quad j = 1$$

$$p_{i3} = \frac{\exp(\beta_{13} + \beta_{23}x_i)}{1 + \exp(\beta_{12} + \beta_{22}x_i) + \exp(\beta_{13} + \beta_{23}x_i)}, \quad j = 1$$

β_{12} , β_{22} mean the parameter for estimating in Choice 2 and β_{13} , β_{23} mean the parameter for estimating in Choice 3

The parameter in choice 1 was equal as 0 to make the probability equal as 1

Define to β_{11} , β_{21} = 0 so the value y_{i1} as equal $\exp(\beta_{11} + \beta_{21}x_i) = \exp(0 + 0x_i) = 1$ to set 1 was (numerator) In case of p_{i1} and it had become to be the component of denominator in each equations

To find the Marginal effect as follow;

$$\frac{\Delta p_{im}}{\Delta x_1} = \frac{\partial p_{im}}{\partial x_i} = p_{im}\left[\beta_{2m} - \sum_{j=1}^{3} \beta_{2j}p_{ij}\right]$$

The equation meant to the value of independent in quantitative had changed for 1 unit or dummy variable had changed from 0 to be 1 by specified other factors to be stable. So the probability had changed follow the marginal effect what it was from the calculation.

3.5 The component of choice decision

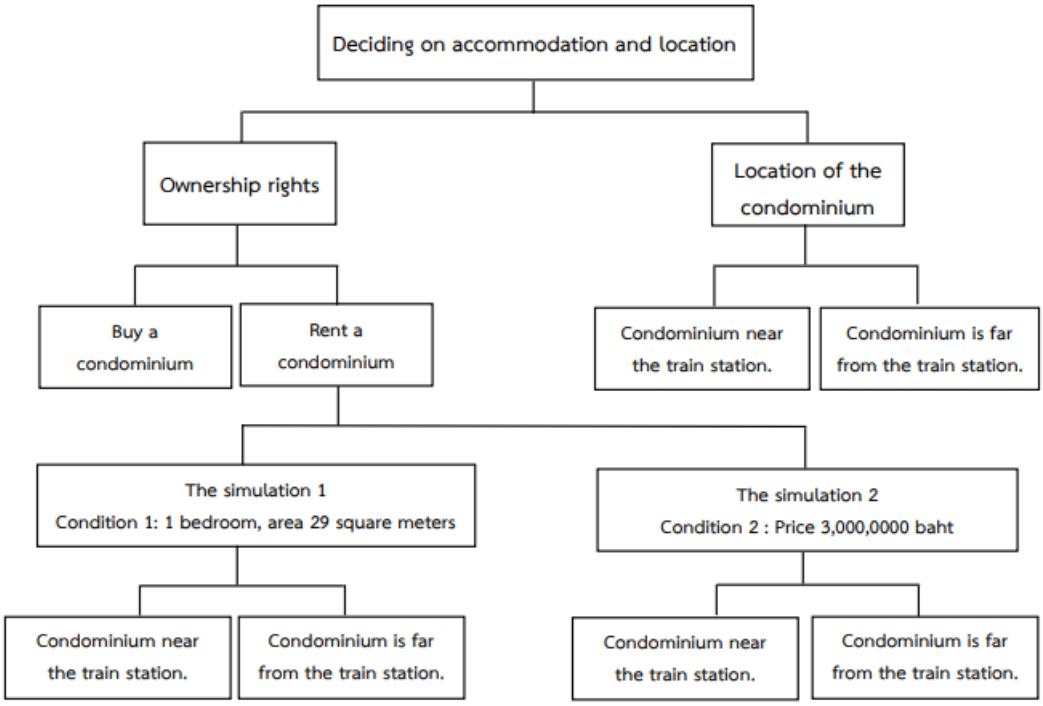


Figure 6 The component of choice decision

Picture 6 showed the stage of the research operation and data collection from the samples.

Stage 1 The data were collected from non-registered population and people who were used to non-registered population before, related to the residential choice as condominium with nearby rail transit stations. The condominium was located at least 500 meters by informants for 200 questionnaires. Moreover, the data collection were from the informants who stayed in the condominium with distant from the rail transit stations at least a kilometer for 200 questionnaires.

Stage 2 The data collection were from non-registered population who rented and stayed in the condominium for 200 questionnaires and people who were used to be non-registered population, purchased or relocated from their town to Bangkok for 200 questionnaires.

Stage 3 The data collection were from non-registered population who rented and stayed in the condominium for 200 questionnaires by using 2 simulations that were created for choosing. The simulation 1 with condition for 1 bedroom and size of room space 29 sq.m,. There were 8 simulations to choose by the samples. The simulation 2 with condition of condominium price for 3 ,000,000 bath per a room. There were 8 simulations to choose by the samples.

CHAPTER 4
RESULTS OF THE STUDY

4.1 Descriptive Statistical Analysis with Revealed Preference (RP)

For the behavioral study about the residential choice as condominium of non-registered population in Bangkok with Revealed Preference (RP), the researcher collected the data by using the questionnaires with people who owned and rented condominiums for 400 questionnaires, and the data collection was operated in March 2021 to June 2021. The results were separated 4 parts; 1.Personal information of the respondents 2. The behavioral information for the residential choice 3. The significant level in the travelling and residential choice. The results data were shown as statistical variables.

4.1.1 Personal Information of the respondents

For the personal information of the respondents. The samples were people who bought the residence as condominium that the location was also nearby and distant from the BTS and MRT station for 200 questionnaires, and the another one was people who rented the residence as condominium that the location was also nearby and distant from the BTS and MRT station for 200 questionnaires. Its were totally 400 questionnaires The topics in questionnaires contained with gender(female), age, status(married), education(edu), occupation(occup), income(inc), household income(hh_inc), cars and household members(hh_menbers) that could be show in the statistical data as follow;

Table 7 The categorized data from 400 questionnaires of respondents

Variable	The number of people	Percentage
Genders		
Male	165	41.25
Female	236	58.75
Total	400	100.00
Status		

Table 7 (Continue)

Variable	The number of people	Percentage
Single	284	70.25
Married	105	26.25
Divorced	7	1.75
Total	400	100.00
Educational level		
Undergraduate	42	10.50
Bachelor's degree	312	78.00
Postgraduate	46	11.50
Total	400	100.00
Occupation		
Governor officer	36	9.00
Company Limited employee (Public Limited)	103	25.75
Self-employed	54	13.50
State enterprise employee	25	6.25
Company Limited employee	158	39.50
Others	24	6.00
Total	400	100.00

Source : The data collection was from the questionnaires.

Table 7 revealed that the statistical data of the respondents by categorized gender and found that there were 165 persons to be male was average at 41.75 of all respondents, and there were 236 persons to be female was average at 58.75 of all respondents.

The statistical data of the. respondents by categorized status and found that there were 284 persons to be single was average at 70.25 of all respondents, then there were 105 persons to be marriage was average at 26.25 all of respondents, and the

divorce persons were 7 persons was average at 1.75 of all respondents. Lastly, the widows were 7 person was average at 1.75 of all respondents as sequence.

The statistical data of the respondents by categorized educational level and found that there were 42 persons to be undergraduate was average at 10.50 of all respondents, and there were 312 persons to be bachelor's degree was average at 78.00 of all respondents. Then. There were 46 persons to be postgraduate was average at 11.50 of all respondents.

The statistical data by categorized occupation found that there were 36 persons to be governor officers was average at 9.00 of all respondents, and there were 103 persons to be company Limited (Public Limited) employee was average at 25.75 of all respondents. Then self-employees were 54 persons was average at 13.50 of all respondents, and state enterprise employee were 25 persons was average at 6.26 of all respondents. Company limited employee were 158 persons was average at 39.50 of all respondents, and others were 24 persons was average at 6.00 of all respondents.

Income average was at 40.47 bath per month which lowest income people got for 14,000 bath and the highest income people got for 500,000 bath. For the household income average was 60,985 bath which the lowest income was 14,000 bath and the highest income was 1,000,000 bath. Cars average was at 1.5575 car which the lowest car was 0, and the highest car was 5 cars. Household member average was at 1.5575 person which the lowest in household member was 1 person and the highest in household member was 7 persons

4.1.2 The personal information of the respondents who bought the condominium with nearby rail transit stations.

For the personal information of the respondents. The samples were people who were used to be non-registered population and they decided to buy condominium that the location was nearby the BTS and MRT stations for 100 questionnaires. The topics in questionnaires contained with gender(female), age, status(married), education(edu) , occupation(occup) , income(inc) , household income(hh_inc), cars and household members(hh_menbers) that could be shown in the statistical data as follow;

Table 8 The categorized data of respondents from 100 questionnaires.

Variable	The number of people	Percentage
Genders		
Male	47	47.00
Female	53	53.00
Total	100	100.00
Status		
Single	69	69.00
Married	27	27.00
Divorced	4	4.00
Total	100	100.00
Educational level		
Undergraduate	4	4.00
Bachelor's degree	76	76.00
Postgraduate	20	20.00
Total	100	100.00
Occupation		
Governor officer	10	10.00
Company Limited employee (Public Limited)	28	28.00
Self-employed	19	19.00
State enterprise employee	8	8.00
Company Limited employee	32	32.00
Others	3	3.00
Total	100	100.00

Source : The data collection was from the questionnaires.

Table 8 revealed that the statistical data of the respondents by categorized gender and found that there were 47 persons to be male was average at 47.00 of all respondents, and there were 53 persons to be female was average at 53.00 of all respondents.

The statistical data of the. respondents by categorized status and found that there were 69 persons to be single was average at 69.00 of all respondents, then there were 27 persons to be marriage was average at 27.00 all of respondents, and the divorce persons were 4 persons was average at 4.00 of all respondents.

The statistical data of the respondents by categorized educational level and found that there were 4 persons to be undergraduate was average at 4.00 of all respondents, and there were 76 persons to be bachelor's degree was average at 76.00 of all respondents. Then. There were 20 persons to be postgraduate was average at 20.00 of all respondents.

The statistical data by categorized occupation found that there were 10 persons to be governor officers was average at 10.00 of all respondents, and there were 28 persons to be company Limited (Public Limited) employee was average at 28.00 of all respondents. Then self-employees were 19 persons was average at 19.00 of all respondents, and state enterprise employee were 8 persons was average at 8.00 of all respondents. Company limited employee were 32 persons was average at 32.00 of all respondents, and others were 3 persons was average at 3.00 of all respondents.

Income average was at 55,212 bath per month which lowest income people got for 14,000 bath and the highest income people got for 400,000 bath. For the household income average was 8 9 ,183 bath which the lowest income was 14,000 bath and the highest income was 830,000 bath. Cars average was at 1.16 car which the lowest car was 0, and the highest car was 4 cars. Household member average was at 1.71 person which the lowest in household member was 1 person and the highest in household member was 5 persons

4.1.3 The personal information of the respondents who bought the condominium with distant from rail transit stations.

For the personal information of the respondents. The samples were people who were used to be non-registered population and they decided to buy condominium that the location was distant the BTS and MRT stations for 100 questionnaires. The topics in questionnaires contained with gender(female), age, status(married), education(edu) , occupation(occup) , income(inc) , household income(hh_inc), cars and household members(hh_menbers) that could be shown in the statistical data as follow;

Table 9 The categorized data of respondents from 100 questionnaires.

Variable	The number of people	Percentage
Genders		
Male	47	47.00
Female	53	53.00
Total	100	100.00
Status		
Single	65	65.00
Married	31	31.00
Divorced	4	4.00
Total	100	100.00
Educational level		
Undergraduate	6	6.00
Bachelor's degree	82	82.00
Postgraduate	12	12.00
Total	100	100.00
Occupation		
Governor officer	13	13.00

Table 9 (Continue)

Variable	The number of people	Percentage
Company Limited employee (Public Limited)	28	28.00
Self-employed	14	14.00
State enterprise employee	9	9.00
Company Limited employee	33	33.00
Others	3	3.00
Total	100	100.00

Source : The data collection was from the questionnaires

Table 9 revealed that the statistical data of the respondents by categorized gender and found that there were 39 persons to be male was average at 39.00 of all respondents, and there were 61 persons to be female was average at 61.00 of all respondents.

The statistical data of the. respondents by categorized status and found that there were 68 persons to be single was average at 68.00 of all respondents, then there were 29 persons to be marriage was average at 29.00 all of respondents.

The statistical data of the respondents by categorized educational level and found that there were 6 persons to be undergraduate was average at 6.00 of all respondents, and there were 82 persons to be bachelor's degree was average at 82.00 of all respondents. Then. There were 12 persons to be postgraduate was average at 12.00 of all respondents.

The statistical data by categorized occupation found that there were 13 persons to be governor officers was average at 13.00 of all respondents, and there were 28 persons to be company Limited (Public Limited) employee was average at 28.00 of all respondents. Then self-employees were 14 persons was average at 14.00 of all

respondents, and state enterprise employee were 9 persons was average at 9.00 of all respondents. Company limited employee were 33 persons was average at 33.00 of all respondents, and others were 3 persons was average at 3.00 of all respondents.

Income average was at 41,865 bath per month which lowest income people got for 15,000 bath and the highest income people got for 500,000 bath. For the household income average was 6 5 ,825 bath which the lowest income was 15,000 bath and the highest income was 1,000,000 bath. Cars average was at 1.03 car which the lowest car was 0, and the highest car was 3 cars. Household member average was at 1.67 person which the lowest in household member was 1 person and the highest in household member was 7 persons

4.1.4 The personal information of the respondents who rented the condominium with nearby rail transit stations.

For the personal information of the respondents. The samples were people who were used to be non-registered population and they decided to rent condominium that the location was nearby the BTS and MRT stations for 100 questionnaires. The topics in questionnaires contained with gender(female), age, status(married), education(edu) , occupation(occup) , income(inc) , household income(hh_inc), cars and household members(hh_menbers) that could be shown in the statistical data as follow;

Table 10 The categorized data of respondents from 100 questionnaires

Variable	The number of people	Percentage
Genders		
Male	39	39.00
Female	61	61.00
Total	100	100.00
Status		
Single	68	68.00
Married	29	29.00
Divorced	1	1.00
Widow	2	2.00

Table 10 (Continue)

Variable	The number of people	Percentage
Total	100	100.00
Educational level		
Undergraduate	12	12.00
Bachelor's degree	80	80.00
Postgraduate	8	8.00
Total	100	100.00
Occupation		
Governor officer	6	6.00
Company Limited employee (Public Limited)	21	21.00
Self-employed	12	12.00
State enterprise employee	2	2.00
Company Limited employee	47	47.00
Others	12	12.00
Total	100	100.00

Source : The data collection was from the questionnaires.

Table 10 revealed that the statistical data of the respondents by categorized gender and found that there were 39 persons to be male was average at 39.00 of all respondents, and there were 61 persons to be female was average at 61.00 of all respondents.

The statistical data of the. respondents by categorized status and found that there were 68 persons to be single was average at 68.00 of all respondents, then there were 29 persons to be marriage was average at 29.00 all of respondents, and the divorce person was 1 person was average at 1.00 of all respondents. For the widows were 2 persons was average at 2.00 of all respondents.

The statistical data of the respondents by categorized educational level and found that there were 12 persons to be undergraduate was average at 12.00 of all respondents, and there were 80 persons to be bachelor's degree was average at 80.00 of all respondents. Then. There were 8 persons to be postgraduate was average at 8.00 of all respondents.

The statistical data by categorized occupation found that there were 6 persons to be governor officers was average at 6.00 of all respondents, and there were 21 persons to be company Limited (Public Limited) employee was average at 21.00 of all respondents. Then self-employees were 12 persons was average at 12.00 of all respondents, and state enterprise employee were 2 persons was average at 2.00 of all respondents. Company limited employee were 47 persons was average at 47.00 of all respondents, and others were 12 persons was average at 12.00 of all respondents

Income average was at 38,630 bath per month which lowest income people got for 15,000 bath and the highest income people got for 200,000 bath. For the household income average was 5 7 ,880 bath which the lowest income was 15,000 bath and the highest income was 500,000 bath. Cars average was at 0.95 car which the lowest car was 0, and the highest car was 5 cars. Household member average was at 1.57 person which the lowest in household member was 1 person and the highest in household member was 7 persons.

4.1.5 The personal information of the respondents who rented the condominium with distant from rail transit stations.

For the personal information of the respondents. The samples were people who were used to be non-registered population and they decided to rent condominium that the location was distant from the BTS and MRT stations for 100 questionnaires. The topics in questionnaires contained with gender(female), age, status(married), education(edu), occupation(occup), income(inc), household income(hh_inc), cars and household members(hh_menbers) that could be shown in the statistical data as follow;

Table 11 The categorized data of respondents from 100 questionnaires

Variable	The number of people	Percentage
Genders		
Male	32	32.00
Female	68	68.00
Total	100	100.00
Status		
Single	79	79.00
Married	18	18.00
Divorced	2	2.00
Widow	1	1.00
Total	100	100.00
Educational level		
Undergraduate	20	20.00
Bachelor's degree	74	74.00
Postgraduate	6	6.00
Total	100	100.00
Occupation		
Governor officer	7	7.00
Company Limited employee (Public Limited)	26	26.00
Self-employed	9	9.00
State enterprise employee	6	6.00
Company Limited employee	46	46.00
Others	6	6.00
Total	100	100.00

Source : The data collection was from the questionnaires.

Table 1 1 revealed that the statistical data of the respondents by categorized gender and found that there were 32 persons to be male was average at 32.00 of all respondents, and there were 68 persons to be female was average at 68.00 of all respondents.

The statistical data of the. respondents by categorized status and found that there were 79 persons to be single was average at 79.00 of all respondents, then there were 18 persons to be marriage was average at 18.00 all of respondents, and the divorce persons were 2 persons was average at 2.00 of all respondents. For the widows was 1 person was average at 1.00 of all respondents.

The statistical data of the respondents by categorized educational level and found that there were 20 persons to be undergraduate was average at 20.00 of all respondents, and there were 74 persons to be bachelor's degree was average at 74.00 of all respondents. Then. There were 6 persons to be postgraduate was average at 6.00 of all respondents.

The statistical data by categorized occupation found that there were 7 persons to be governor officers was average at 7.00 of all respondents, and there were 26 persons to be company Limited (Public Limited) employee was average at 26.00 of all respondents. Then self-employees were 9 persons was average at 9.00 of all respondents, and state enterprise employee were 6 persons was average at 6.00 of all respondents. Company limited employee were 46 persons was average at 46.00 of all respondents, and others were 6 persons was average at 6.00 of all respondents

Income average was at 26,177 bath per month which lowest income people got for 15,000 bath and the highest income people got for 80,000 bath. For the household income average was 3 1 ,050 bath which the lowest income was 15,000 bath and the highest income was 100,000 bath. Cars average was at 0.84 car which the lowest car was 0, and the highest car was 3 cars. Household member average was at 1.28 person which the lowest in household member was 1 person and the highest in household member was 4 persons.

4.1.6 The behavioral data for residential choice

For the behavioral studies about the residential choice, the data was collected by using the questionnaire who they were purchaser and rents condominium for the residential and location choice decision. The data related to traveling behavior and environment in daily life that contained with 1.The traveling for work 2. The residence information 3. The residential location there were shown as follow;

1. The traveling for work information

For the traveling for work study was about the traveling behavior of the respondents travel from their residence to the office. The question required asking the detail about time for traveling per a month, expense for traveling per a month, Duration in traveling to work per time. The detail in questionnaire were contained;

1. Frequency for traveling by public bus or van is time per a month (freq_bus)
2. Expense to pay for traveling by public bus or van is a hundred bath per a month. (exp_bus)
3. Frequency for traveling by the rail transits(BTS and MRT) is per a month. (freq_bts)
4. Expense to pay for traveling by the rail transits(BTS and MRT) is a hundred bath per a month. (exp_bts)
5. Frequency for traveling by the Taxi-Meter or calling Grab service and other service is time per a month.(freq_taxi)
6. Expense to pay for traveling by Taxi-Meter or calling Grab service and other service is a hundred bath per a month (exp_taxi)
7. Frequency for traveling by private cars time per a month (freq_cars)
8. Expense to pay for private cars is a hundred bath per a month. (exp_cars)
9. Duration for traveling by the van or public bus from the residence to the office is minutes per a day (time_bus)
10. Duration for traveling by the rail transits(BTS and MRT) from the residence to the office is minutes per a day (time_bts)
11. Duration for traveling by taxi-meter or Grab service and other service from

the residence to the office is minutes per a day. (time_taxi)

12. Duration for traveling by private cars from the residence to the office is minutes per a day. (time_cars)

The result was found that frequency for traveling by public bus was average at 3.4250 per a month which the lowest in traveling was at 0 per a month and the highest traveling was at 28 per a month. Expense for traveling by public bus was average at 1.6917 hundred bath per a month which the lowest expense was at 0 bath and the highest expense was 24 hundred bath per a month. For the frequency for traveling by rail transits was average at 6.45 per a month which the lowest traveling was at 0 per a month and the highest traveling was at 28 per a month. Expense for traveling by rail transits was average at 5.1833 hundred bath per a month which the lowest expense was at 0 bath per a month and the highest expense was at 52 hundred bath per a month. Frequency for traveling the taxi-meter was average at 2.7450 per a month which the lowest traveling was at 0 per a month and the highest traveling was at 28 per a month. Expense for traveling by taxi-metre was average at 4.0904 hundred bath per a month which the lowest expense was at o bath per a month and the highest expense was at 100 hundred bath per a month. Frequency for traveling by private cars was average at 14.3375 per a month which the lowest traveling was at 0 per a month and the highest traveling was at 30 per a month. Expense for traveling by private cars was average at 21.0620 hundred bath per a month which the lowest expense was at 0 bath per a month and the highest expense was at 280 hundred bath per a month. For the duration in traveling from the residence to the office by the public bus was average at 10.4975 minutes per time which the lowest duration was at 0 per time and the highest duration was at 120 minutes per time. Duration in traveling to work by rail transits(BTS and MRT) was average at 12.6900 minutes per time which the lowest duration was at 0 minute per time and the highest duration was at 120 minutes per time. Duration in traveling to work by taxi-meter was average at 12.8625 minutes per time which the lowest duration was at 0 minute per time and the highest duration was at 120 minutes per time. Duration in traveling to work by private cars was average at 29.5700 minutes per time which the

lowest duration was at 0 minute per time and the highest duration was at 90 minutes per time

2. The residence information

For the residence data study was about size, price , facilities and convenience that the detail in questionnaires contained;

1. Size of the residence (Sq,m. per room) (house_size)
2. Price of the residence (10 thousands per Sq,m.)(price_sqm)
3. The number of floors in the project (floors)
4. The fitness and sport center in the project for condition;

   If the fitness or sport center were at 0 but 1 was no in the project (no_fitness)
5. The swimming pool in residence project for condition;

   If swimming pool was 0, but 1 was no in the project. (no_pool)

The result was found that the size of room was average at 33.9525 sq,m. which the smallest size was at 20 sq,m. per room and the biggest size was at 69 sq,m. per room. Price was average at 8.5611 of 10 thousands bath per sq,m. which the lowest price was at 2.3 of 10 thousands bath per sq,m. and the highest price was at 18 of 0 thousands per sq,m. the number of floor was average at 21.0250 floors which the lowest floor was at 2 floors and the highest floor was at 46 floors. For the fitness and sport center, If the resident project has fitness and sport center was defined at 0 but 1 was no for the fitness and sport center. Swimming pool was defined 0 if the resident project was there but 1 was no for swimming pool.

3. The residential location information

For the residential location data study was about the respondents that related to the environment and facilities of the resident project. The detail in questionnaire contained with;

1. Distance from the residence to rail transits station(BTS and MRT) is for kilometer. (dist_bts)
2. Distance from the residence to the bus stop is for kilometer (dist_bus)
3. The population density in each district is for a thousand person per sq,km. of

area.(pop_density)

4 . The university was located nearby the residence at least a kilometer. If the university was there at 0 but 1 was no there. (no_university)

5 . The hospital was located nearby the residence at least a kilometer. If the hospital was there at 0 but 1 was no there. (no_hospital)

6. Frequency for traveling to the shopping mall (freq_mall)

7. Distance from the residence to the shopping mall was kilometer (dist_mall)

8 . The tollway entry was nearby the residence at least a kilometer. If the tollway entry was there at 0 but 1 was no the tollway(no_tollway)

9. Expense for common fee was bath per sq,m.(exp_condo)

The result was found that the distance from the residence to the rail transits station(dist_bts) was average at 1.4056 kilometer which the lowest distance was at 0.10 kilometer and the highest distance was at 10 kilometers. Distance from the residence to the bus stop(dist_bus)was average at 0.6515 kilometer which the lowest distance was at 0.02 kilometer and the highest distance was at 5 kilometers. The population density(pop_density) was average at 7.0825 thousands of person per sq,km. which the lowest density was at 1.52 thousand of person per sq,.km and the highest density was at 45.42 thousand of person per sq,km. Moreover, the distance or the area around the residence where is under a kilometer at least, if there was the university located, that defining to be 0 but there was no at 1(no_university). Hospital was there that defining to be 0, but there was no hospital to be 1(no_hospital). Frequency for traveling to shopping mall(freq_mall) was average at 4.8650 per a month which the lowest frequency at 0 per a month and the highest frequency was at 30 times per a month. Distance for traveling from the residence to shopping mall(dist_mall) was average at 2.5576 kilometer which the lowest distance was at o kilometer and the highest distance was at 8 kilometers. The tollway entry at least a kilometer that defined to be 0 was but there is no tollway entry was 1(no_tollway) . Expense for common fee of the condominium(exp_condo) was average at 40.3625 bath per sq,m. which the lowest fee at 10 bath per sq,m. and the highest fee at 79 bath per sq,m.

4.1.7 The significant level in the residential choice and transportation

For the significant level in the residential choice and transportation study was about the respondents' data. The data were collected from the questionnaire that the respondents were only rents condominium. The detail in questionnaire had effected to condominium choice decision that contained with; 1. Condominium price(condo_price) 2. Expense for traveling to work(travel_expen) 3 .Distance for traveling to work(distan_work) 4.The location nearby rail station(near_station) 5. Public transportation(public_tran) 6. The number of household member(number_house)7. The population density(pop_density) 8. Distance for traveling to shopping mall(distan_mall)9. Size of condominium(size_condo) 10. Common space & Fitness , swimming pool(fitnes_pool) 11. Safety in condominium(safety_condo) 12. Price for resell(resale_price) 13. Rental Price 14. The company for development condominium(develop_company) 15. The area is no flood(area_no flood 16. The area is no protests(area_no proteste). The data as shown as follow

Table 12 The categorized significant about the purchasing condominium of the respondents

Interesting factor	Very High	High	Moderate	Low	Very Low
condo_price	226	130	39	5	0
(Percentage)	(56.50)	(32.50)	(9.75)	(1.25)	(0.00)
travel_expen	140	169	68	17	6
(Percentage)	(35.00)	(42.25)	(17.00)	(4.25)	(1.50)
distan_work	165	157	60	14	4
(Percentage)	(41.25)	(39.25)	(15.00)	(3.50)	(1.00)
near_station	130	132	114	22	2
(Percentage)	(32.50)	(33.50)	(28.50)	(5.50)	(0.50)
public_tran	88	133	112	51	16
(Percentage)	(22.00)	(33.25)	(28.00)	(12.75)	(4.00)

Table 12 (Continue)

Interesting factor	Very High	High	Moderate	Low	Very Low
number_house	78	126	145	44	7
(Percentage)	(19.50)	(31.50)	(36.25)	(11.00)	(1.75)
pop_density	65	131	160	43	1
(Percentage)	(16.25)	(32.75)	(40.00)	(10.75)	(0.25)
distan_mall	75	107	162	50	6
(Percentage)	(18.75)	(26.75)	(40.50)	(12.50)	(1.50)
size_condo	138	167	88	6	1
(Percentage)	(34.50)	(41.75)	(22.00)	(1.50)	(0.25)
fitnes_pool	145	154	92	7	2
(Percentage)	(36.25)	(38.50)	(23.00)	(1.75)	(0.50)
safety_condo	272	110	17	1	0
(Percentage)	(68.00)	(27.50)	(4.25)	(0.25)	(0.00)
resale_price	163	144	76	13	4
(Percentage)	(40.75)	(36.00)	(19.00)	(3.25)	(1.00)
rental_price	111	179	85	17	8
(Percentage)	(27.75)	(44.75)	(21.25)	(4.25)	(2.00)
develop_company	154	156	76	10	4
(Percentage)	(38.50)	(39.00)	(19.00)	(2.50)	(1.00)
area_no flood	211	118	50	16	5
(Percentage)	(52.75)	(29.50)	(12.50)	(4.00)	(1.25)
area_no proteste	184	111	70	19	16
(Percentage)	(46.00)	(27.75)	(17.50)	(4.75)	(4.00)

Source : The data was from the questionnaire

From the table 12 showed the statistical data of the respondents found that condominium price(condo_price) was in the great extent by choosing in level of excellent was 226 persons to account for 56.50 and good was 130 persons to account for 32.50, there was nobody in poor and very poor criteria. Expense for traveling to work(travel_expen) was in great extent by choosing in level of good was 169 persons to account for 42.25, and level of excellent was 140 persons to account for 35.00. There were 6 persons to choose in very poor level to account for 1.50 at the least. Distance for traveling to work(distan_work) was in great extent by choosing in the level of excellent was 165 persons to account for 41.25, and level of good was 157 persons to account for 39.25. There were 4 persons to choose in very poor to account for 1.00 at the least. The condominium location nearby rail station(near_station) was in great extent by choosing in the level of good was 132 person to account for 33.50, and level of excellent was 130 to account for 32.50. There were 2 persons to choose in very poor to account for 0.50 at the least. The public transportation(public_tran) was in great extent by choosing in the level of good was 133 persons to account for 33.25, and the level of fair was 112 persons to account for 28.00. There were 16 persons to choose in the level very poor to account for 4.00 at the least. The number of household members(number_house) was in great extent by choosing in the level of fair was 145 persons to account for 36.25, and the level of good was 126 persons to account for 31.50. There were 7 persons to choose in the level of very poor to account for 1.175 at the least. The population density(pop_density) was in great extent by choosing in the level of fair was 160 persons to account for 40.00, and the level of good was 131 persons to account for 32.75. There was a person to choose in the level of very poor to account for 0.25 at the least. Distance for traveling to shopping mall(distan_mall) was in great extent by choosing in the level of fair was 162 persons to account for 40.50, and the level of good was 107 persons to account for 26.75. There were 6 persons to choose in the level of very poor to account for 1.50 at the least. Size of condominium(size_condo) was in great extent by choosing in the level of good was 167 persons to account for 41.75, and the level of excellent was 138 persons to account for 34.50. There was a person to

choose in the level of very poor to account for 0.25 at the least. Common space fitness and swimming pool(fitnes_pool) was in great extent by choosing in the level of good was 154 persons to account for 38.50, and the level of excellent was 145 person to account for 36.25. There were 2 persons to choose in the level of very poor to account for 0.50 at the least. Safety in condominium(safety_condo) was in great extent by choosing in the level of excellent was 272 persons to account for 68.00, and the level of good was 110 to account for 27.50. There was no person to choose in the level of very poor. Price for resell was in great extent by choosing the level of excellent was 163 to account for 40.75, and the level of good was 144 persons to account for 36.00. There were 4 persons to choose in the level of very poor to account for 1.00 at the least. Rental price was in great extent by choosing the level of good was 179 persons to account for 44.75, and the level of excellent was 111 persons to account for 21.75. There were 8 persons to choose in the level of very poor to account for 2 at the least. The company development(develop_company) was in great extent by choosing the level of good was 156 persons to account for 39.00, and the level of excellent was 154 persons to account for 38.50. There were 4 persons to choose in the level of very poor to account for 1.00 at the least. The area is no flood was in great extent by choosing in the level of excellent was 211 persons to account for 52.75, and the level of good was 118 persons to account for 29.50. There were 5 persons to choose in the level of very poor to account for 1.25 at the least. The area is no protests was in great extent by choosing in the level of excellent was 184 persons to account for 46.00, and the level of good was 111 persons to account for 27.75. There were 16 persons to choose in the level of very poor to account for 4.00 at the least.

4.2 The analysis results for studying the factors which had an influence to residential choice for buying and renting condominium by using Revealed Preference (RP)

For the behavioral studies about the residential choice of non-registered population in Bangkok , the data was collected by using the questionnaire for 400 questionnaires from the respondents who they were purchasers and rents condominium for the residential and location choice decision. The data was shown in descriptive statistical analysis and found that the data collect was suitable for study

because the value of data wasn't in outlier , and then the data was analyzed with the statistic package software. The variables were defined as follow;

The dependent variables in the equation model

The purchasing condominium equation

To defined buying = 1 and renting =0

The independent variables in the equation model

1. Gender

Condition; Male = *0* / Female = *1*

2. Age

3. Status

Condition; Single = *0* / Married = *1* / Divorced = *2* / Widow = *3*

4. Educational Level

Condition; Undergraduate = *0* / Bachelor's Degree = *1* / Postgraduate = 2

5. Occupation

Condition; Goverrnent officer = *0* / Company Limited employee(Public*)* = *1* / Self-employee = *2* / State enterprise employee = *3* / Company Limited employee = *4* /Others = *5*

6. Income*(*inc*)*

7. Household Income*(*hh_inc)

8. The number of cars in household*(*cars*)*

9. The household members*(*hh_menbers*)*

10. Frequency for traveling by public transportation was time per a month *(*freq_bus*)*

11. Expense for traveling by public transportation was a hundred bath per a month *(*exp_bus)

12. Frequency for traveling by rail transits was time per a month *(*freq_bts)

13. Expense for traveling by rail transits was a hundred bath per a month

(exp_bts)

14. Frequency for traveling by taxi-meter or Grab service and others was time per a month (freq_taxi)

15. Expense for traveling by taxi-meter or Grab service and others was a hundred bath per a month(exp_taxi)

16. Frequency for traveling by using private cars was time per a month (freq_cars)

17. Expense for traveling by using the private cars was a hundred bath per a month(exp_cars)

18. Duration in traveling from the residence to work office by public transportation was minutes per a day(time_bus)

19. Duration n traveling from the residence to work office by rail transits was minutes per a day (time_bts)

20. Duration for traveling from the residence to work office by taxi-meter or Grab service and others was minutes per a day(time_taxi)

21. Duration for traveling from the residence to work office by private cars was minutes per a day (time_cars)

22. Size of residence Sq,m. per room(house_size)

23. Price of residence was bath per Sq,m. (price_sqm)

24. The number of floors (floors)

25. Fitness and sport center(no_fitness)

Condition; available = 0 /unavailable = 1

26. Swimming pool (no_pool)

Condition available = 0 /unavailable = 1

27. Distance for traveling from the residence to the rail transits station (kilometer)(dist_bts)

28. Distance for traveling from the residence to the bus stop(Kilometer) (dist_bus)

29. The population density was a thousand person per Sq,Km)

*(*pop_density*)*

30. The university was located in the area at least for 1 kilometer (no_university) Condition available = *0 /*unavailable = 1

31. The hospital was located in the area at least for 1 kilometer no_hospital) Condition; available = *0 /*Unavailable = 1

32. Frequency for traveling to shopping mall was time per a month*(*freq_mall*)*

33. Duration for traveling from the residence to shopping mall(Kilomter) *(*dist_mall*)*

34. The tollway was located nearby the area at least 1 kilometer*(*no_tollway*)* Condition available = *0 /*unavalable = 1

35. Common fee was bath per Sq.m. *(*exp_condo*)*

The result was analyzed by using econometric model for finding factors what its effected to the residential choice decision for buying and renting condominium. The data was collected by Reveal Preference which was the econometric analyzed method to estimate value with Binary Logit Model. The data was collected until on March 2021 to June 2021 for 400 questionnaires.

4.2.1 The analysis result of the samples who were used to be non-registered population before and the residential choice decision as condominium

The analysis result by using Reveled Preference (RP) was the data observation about the residential choice decision of the samples who were used to be non-registered population before and rents condominium in Bangkok. The model was used in the research

According to the analysis result of sample who purchasing the condominium, the researcher had cut off 12 variables such as; Frequency for traveling by public bus(freq_bus) , Expense for traveling from the residence to work office by public bus(exp_bus) , Duration in traveling from the residence to work office by public bus(time_bus), The number of floors(floors), Fitness &sport center(no_fitness), Distance for traveling from the residence to the rail transits station(dist_bts), Distance for traveling

from the residence to the bus stop(dist_bus) , The population density(pop_density) , University nearby the resident area 1 km., (no_university) Hospital nearby the resident area 1 k.m. (no_hospital), Frequency for traveling to shopping mall(freq_mall) , Tollway entry nearby the resident area 1 k.m(no_tollway) . The researcher found that the model which it was suitable to analyze the result about the residential choice decision of non-registered population in Bangkok so that it had AIC at least for possible to operate appropriately in the research as follow;

Buy a condominium = f(female, age, status, edu, occup, inc, hh_inc, cars, hh_menbers, freq_bts, exp_bts, freq_taxi, exp_taxi, freq_cars, exp_cars, time_bts, time_taxi, time_cars, house_size, price_sqm, no_pool, dist_mall, exp_condo)

Table 13 The analysis result of the sample for the residential choice as condominium in marginal effect

Number of obs 400		Log likelihood = -236.8843		
Variable	dy/dx	standard error	z	P>|z|
Female	-0.0966	0.0474	-2.04	0.041**
Age	0.0033	0.0036	0.91	0.361
Status				
Married	-0.1335	0.0856	-1.56	0.119
Divorced	0.0352	0.1537	0.23	0.819
Widow	-0.0368	0.1776	-0.21	0.836
Educational Level				
Bachelor's degree	0.2443	0.0768	3.19	0.001***
Postgraduate	0.3184	0.1085	2.93	0.003***
Occupation				
Company Limited employee(Public)	-0.0708	0.0906	-0.78	0.435
Self-employee	-0.0763	0.1048	-0.73	0.467

Table 13 (Continue)

Number of obs 400		Log likelihood = -236.8843		
Variable	**dy/dx**	**standard error**	**z**	**P>|z|**
State Enterprise employee	0.0643	0.1169	0.55	0.582
Company Limited employee	-0.1779	0.0848	-2.10	0.036**
Others	-0.2966	0.1214	-2.44	0.015**
Inc	0.0327	0.0143	2.30	0.022**
hh_inc	-0.0080	0.0052	-1.52	0.128
Cars	-0.0086	0.0500	-0.17	0.863
hh_menbers	0.0722	0.0425	1.70	0.089*
freq_bts	-0.0051	0.0057	-0.91	0.364
exp_bts	0.0070	0.0057	1.22	0.221
freq_taxi	-0.0183	0.0087	-2.09	0.036**
exp_taxi	0.0086	0.0044	1.95	0.051*
freq_cars	-0.0040	0.0036	-1.10	0.272
exp_cars	0.0001	0.0016	0.00	0.996
time_bts	-0.0002	0.0018	-0.09	0.929
time_taxi	-0.0014	0.0015	-0.94	0.347
time_cars	0.0034	0.0012	2.72	0.007***
house_size	0.0043	0.0026	1.67	0.095*
price_sqm	-0.0182	0.0106	-1.72	0.085*
no_pool	-0.1409	0.1060	-1.33	0.184
dist_mall	0.0228	0.0134	1.70	0.090*
exp_condo	0.0030	0.0031	0.94	0.345
Prob > chi2 = 0.0001		**AIC : 1.354**	**Count R2 : 0.665**	

Source : The data calculation

Note : *** refer to significant at p< 0.01

** refer to significant at p< 0.05

* refer to significant at p< 0.10

From table 13 found that the factors that influencing to the residential choice decision as condominium in significant at p< 0.01 such as; people who were in bachelor's degree and postgraduate(edu) were possible to be influent buying the condominium increasingly at 31.84 and 24.83, respectively when comparing to the undergraduate. Duration for traveling to work by private cars(time_cars) was possible to be influent buying the condominium increasingly averaged at 0.34.

The factors were significant at p<0.05 such as; the female was possible to be influent buying the condominium increasingly averaged at 9.66 when comparing to male. The company Limited employee and general employee(occup) were possible to be influent buying condominium decreasingly averaged at 17.79, 29.66, respectively when comparing to the governor office. Income(inc) is possible to be influent to choose increasingly averaged at 3.27. Frequency for traveling by taxi meter(freq_taxi) was possible to influent buying condominium decreasingly averaged at 1.83

The factors were significant at p<10 such as; The number of household member (hh_menbers) was possible to be influent buying condominium increasingly averaged at 7.22. Expense for traveling by taxi-meter (exp_taxi) was possible to be influent buying condominium decreasingly averaged at 0.86. Size of condominium (house_size) was possible to be influent buying condominium increasingly averaged at 0.43. Condominium Price (Sq.m) was possible to be influent buying condominium decreasingly averaged at 1.82. Distance foe traveling to shopping mall(dist_mall) was possible to be influent buying condominium increasingly averaged at 2.28

4.3 The analysis results for studying the factors which had an influence to residential choice for buying and renting condominium where was located nearby and distant from rail transit stations by using Revealed Preference (RP)

For the behavioral studies about the residential choice of non-registered population in Bangkok (Case study: Condominium) , the data was collected by using the questionnaire for 400 questionnaires from the respondents who they chose the condominium where was located nearby and distant from rail transit stations. The data was shown in descriptive statistical analysis and found that the data collect was suitable for study because the value of data wasn't in outlier , and then the data was analyzed with the statistic package software. The variables were defined as follow;

The dependent variables in the equation model

1. The residential choice for internal rail transit station equation

To specific Near is *1* / distant from rail stations is *0*

The independent variables in the equation model

There were 35 independent variables in the equation model. All of the variables were similar to be the variables of the analysis results for studying the factors which had an influence to residential choice for buying and renting condominium by using Revealed Preference (RP)

The result was analyzed by using econometric model for finding factors what its effected to the residential choice decision as condominium where was located nearby and distant from rail transit stations. The data was collected by Reveal Preference which was the econometric analyzed method to estimate value with Binary Logit Model. The data was collected until on March 2021 to June 2021 for 400 questionnaires.

4.3.1 The analysis result of the samples who were used to be non-registered population before and the residential location choice decision as condominium where was located nearby and distant from rail transit stations.

The analysis result with Revealed Preference (RP) was the data observation about the residential location choice decision that was nearby rail transits station of the samples who were used to be non-registered population before and rents condominium in Bangkok. The model was used in the research.

According to the analysis result of sample who purchasing the condominium, the researcher had cut off 12 variables such as; Frequency for traveling by public bus(freq_bus), Expense for traveling by public bus(exp_bus), Distance for traveling from the residence to work office(time_bus), The number of floors, Fitness center(no_fitness), Distance for traveling from the residence to the rail station(dist_bts) , Distance for traveling from the residence to bus stop(dist_bus), The population density(pop_density), University nearby the resident area 1 km. (no_university) , Hospital nearby the resident area 1 k.m. (no_hospital), Frequency for traveling to shopping mall(freq_mall), Tollway entry nearby the resident area 1 k.m(no_tollway). The researcher found that the model which it was suitable to analyze the result about the residential choice decision of non-registered population in Bangkok so that it had AIC at least for possible to operate appropriately in the research as follow

Buy a condominium = f(female, age, status, edu, occup, inc, hh_inc, cars, hh_menbers, freq_bts, exp_bts, freq_taxi, exp_taxi, freq_cars, exp_cars, time_bts, time_taxi, time_cars, house_size, price_sqm, no_pool, dist_mall, exp_condo)

Table 14 The analysis result of the sample for the residential location choice as condominium that was nearby rail transits station in marginal effect

Number of obs 400		Log likelihood = -108.6273		
Variable	dy/dx	standard error	z	P>|z|
Female	-0.0289	0.0286	-1.01	0.313
Age	-0.0074	0.0025	-2.90	0.004***
Status				
Married	0.0130	0.0537	0.24	0.809
Divorced	0.2889	0.0571	5.06	0.000***
Widow	0.0648	0.0892	0.73	0.468

Table 14 (Continue)

Number of obs 400		Log likelihood = -108.6273		
Variable	dy/dx	standard error	z	P>|z|
Educational Level				
Bachelor's degree	-0.0997	0.0366	-2.72	0.007***
Postgraduate	-0.1000	0.0662	-1.51	0.131
Occupation				
Company Limited employee(Public)	-0.1556	0.0526	-2.96	0.003***
Self-employee	-0.1232	0.0595	-2.07	0.039**
State Enterprise employee	-0.1007	0.0748	-1.35	0.178
Company Limited employee	-0.0833	0.0509	-1.63	0.102
Others	-0.1576	0.0738	-2.13	0.033**
Inc	0.0027	0.0078	0.34	0.732
hh_inc	-0.0007	0.0040	-0.17	0.864
Cars	-0.0239	0.0376	-0.64	0.524
hh_menbers	0.0164	0.0313	0.52	0.601
freq_bts	0.0043	0.0032	1.35	0.178
exp_bts	-0.0050	0.0035	-1.42	0.155
freq_taxi	-0.0120	0.0045	-2.64	0.008***
exp_taxi	0.0005	0.0023	0.22	0.824
freq_cars	-0.0020	0.0022	-0.90	0.371
exp_cars	0.0003	0.0007	0.46	0.644
time_bts	0.0027	0.0013	2.13	0.033**
time_taxi	0.0017	0.0009	1.90	0.058*
time_cars	-0.00002	0.0008	-0.03	0.978
house_size	0.0011	0.0017	0.66	0.511

Table 14 (Continue)

Number of obs 400		Log likelihood = -108.6273		
Variable	dy/dx	standard error	z	P>|z|
price_sqm	0.0964	0.0049	19.51	0.000***
no_pool	-0.3019	0.1061	-2.84	0.004***
dist_mall	-0.0170	0.0074	-2.29	0.022**
exp_condo	-0.0023	0.0022	-1.04	0.297
Prob > chi2 = 0.0000		AIC : 0.713	Count R2 : 0.885	

Source : The calculation

Note : *** refer to significant at p< 0.01
** refer to significant at p< 0.05
* refer to significant at p< 0.10

Table 17 found that the factors that influencing to the residential location choice decision as condominium that was nearby rail transits station in significant at p< 0.01 such as; age was possible to influent buying the condominium decreasingly averaged at 0.74. Divorced(status) was possible to influent buying the condominium increasingly averaged at 28.89 when comparing to single. Bachelor's degree(edu) was possible to influent buying the condominium decreasingly averaged at 9.97 when comparing to undergraduate. Company Limited(Public) employee)(occup) was possible to influent buying the condominium decreasingly averaged at 15.56 when comparing to the governor officer. Frequency for traveling by taxi-meter(freq_taxi) was possible to influent buying the condominium decreasingly averaged at 1.20. Condominium price per a sq,m. (price_sqm) was possible to influent buying the condominium increasingly averaged at 9.64. The residence where was no swimming pool(no_pool) was possible to be influent buying the condominium decreasingly averaged at 30.91

The factors were significant at $p<0.05$ such as; self-employee or others(occup) were possible to influent buying the condominium decreasingly averaged at 12.31 and 15.76, sequence when comparing to the governor officer. Duration for traveling from work office by rail transits(time_bts) was possible to influent buying the condominium increasingly averaged at 0.27. Distance for traveling from the residence to shopping mall(dist_mall) was possible to influent buying the condominium decreasingly averaged at 1.70

The factors were significant at $p<0.10$ such as; duration for traveling by taxi-meter from the residence to work office(time_taxi) was possible to influent buying the condominium increasingly averaged at 0.17

4.4 The analysis results for studying the factors which had an influence to residential choice for buying the condominium where was located nearby and distant from rail transit stations by using Stated Preference (SP)

For the behavioral studies about the residential choice of non-registered population in Bangkok, the data was collected by using the stated Preference method which it was the data observation about the residential choice decision as condominium under the simulation for the first time. The simulation was created 2 conditions to choose in; 1. The simulation with the size of usable area 2. The simulation with the budget for buying a condominium, and then the data was the econometric analyzed method to estimate value with Multinomial logistic regression (MLR). The data was collected until on March 2021 to June 2021 for 200 questionnaires.

4.4.1 The data of the behavior for residential choice in the simulation (Stated Preference)

For the behavioral studies about the residential choice of non-registered population in Bangkok, the data was collected by using the stated Preference method which it was the data observation about the residential choice decision as condominium under the simulation for the first time. The simulation was created 2 conditions to choose in; 1. The simulation with the size of usable area 2. The simulation with the budget for buying a condominium, and then the data was the econometric analyzed method to

estimate value with Multinomial logistic regression (MLR). The data was collected until on March 2021 to June 2021 for 200 questionnaires.

1. The Simulation 1

The residential choice decision as condominium; 1 room with 29 sq,m. of the useable area, and the condominium locations were contained for 2 types 1 condominium where was located nearby the rail transit stations. 2. The condominium was located distant from the rail transit stations. The factors which had an influence to residential choice for buying the condominium were contained as follow;

1. Price of condominium for a hundred thousand bath per a room. (price_condo)
2. Duration for traveling to work minute per time (time_travel)
3. Expense for traveling to work bath per time (exp_travel)
4. Income of the condominium purchaser a thousand per a month. (income)

The analysis result was found that price of condominium(price_condo) was average at 28.8750 a hundred thousand bath per a room which the lowest price was at 19 a hundred thousand bath per a room and the highest price was at 43.50 a hundred thousand bath per a room. Duration for traveling to work(time_travel) was average at 33.6875 minutes per time which the lowest duration was at 5 minutes per time and the highest duration was at 90 minutes per time. Expense for traveling to work (exp_travel) was average at 50.0000 bath per time which the lowest expense was at 23 bath per time and the highest expense was at 64 bath per time. Income of the condominium purchaser (income) was average at 45.0000 thousands per a month which the lowest income was at 35 thousands per a month and the highest income was at 55 thousands per a month

2. The simulation 2

The residential choice decision as condominium; the price 3,000,000 bath per a room, and the condominium locations were contained for 2 types 1 condominium where was located nearby the rail transit stations. 2. The condominium was located

distant from the rail transit stations. The factors which had an influence to residential choice for buying the condominium were contained as follow;

1. Size of room sq,m. per a room(room_size)
2. Distance for traveling to shopping mall per a kilometer(dist_mall)
3. Fitness and swimming pool To defined there was = 1 /there was no = 0 (fitness_pool)
4. The number of bedrooms room(bedroom)

The analysis result was found that size of room(room_size) was average at 32.7500 sq,m. per a room which the smallest size was at 20 sq,m. per a room and the biggest size was at 4 6 sq,m. per a room. Distance for traveling to shopping mall (dist_mall) was average at 2.8750 kilometers which the lowest distance was at 0.50 kilometers and the highest distance was at 6.00 kilometers. Fitness and swimming pool To defined there was = 1 /there was no = 0 (fitness_pool). The number of bedrooms (bedroom) was average at 1 room which the lowest bedroom was at 0 the highest bedroom was at 2 rooms

4.4.2 The analysis result of non-registered population in the simulation 1

The analysis result by using Stated Preference (SP) was the data observation about the simulator which was under the condition of useable area for the residential choice decision as condominium; 1 room with 29 sq,m. of the useable area, and 3 choice. 1. The residential choice as condominium where was located nearby the rail transit station. 2. The residential choice as condominium where was located distant from the rail transit stations. 3.To neglect for choice as condominium. The result could present to be in the probability of the residential choice of non-registered population in Bangkok as follow in picture 6;

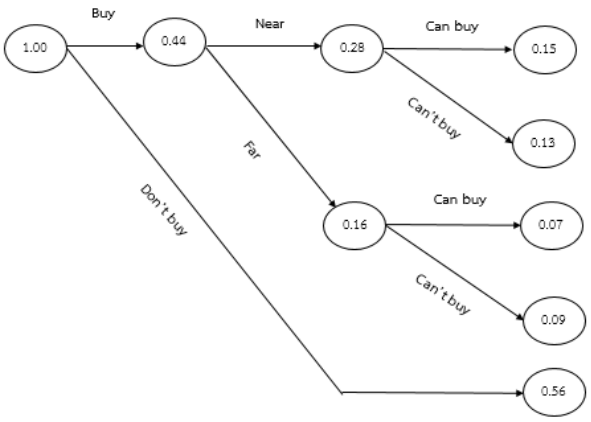


Figure 7 The probability of non-registered population for the residential choice decision under the condition in useable area

Source : The calculation

The analysis result found that non-registered population neglected to buy the condominium in the simulation averaged at 56%, and 44% of non-registered population had decided to buy the condominium in the simulation. The samples who decided to buy the condominium where was located nearby the rail transit stations were average at 28%. The samples who were potential to buy the condominium where was located nearby the rail transit stations were average at 15%. The samples who were unable to buy the condominium where was located nearby the rail transit stations were average at 13%. The samples who decided to buy the condominium where was located distant from the rail transit stations were average at 16%. The samples who were potential to buy the condominium with nearby the rail transit stations were average at 7%. The samples who were unable to buy the condominium with nearby the rail transit stations were average at 9%.

Model in research

Buy a condominium = f(price_condo, time_travel, exp_travel, income)

Where Buy a condominium was 3 of choices for the residential purchasing.

price_condo was condominium price (hundred and thousand bath)

time_travel was duration for traveling (minute)

exp_travel was expense for traveling

income was income per a month (Ten thousand bath)

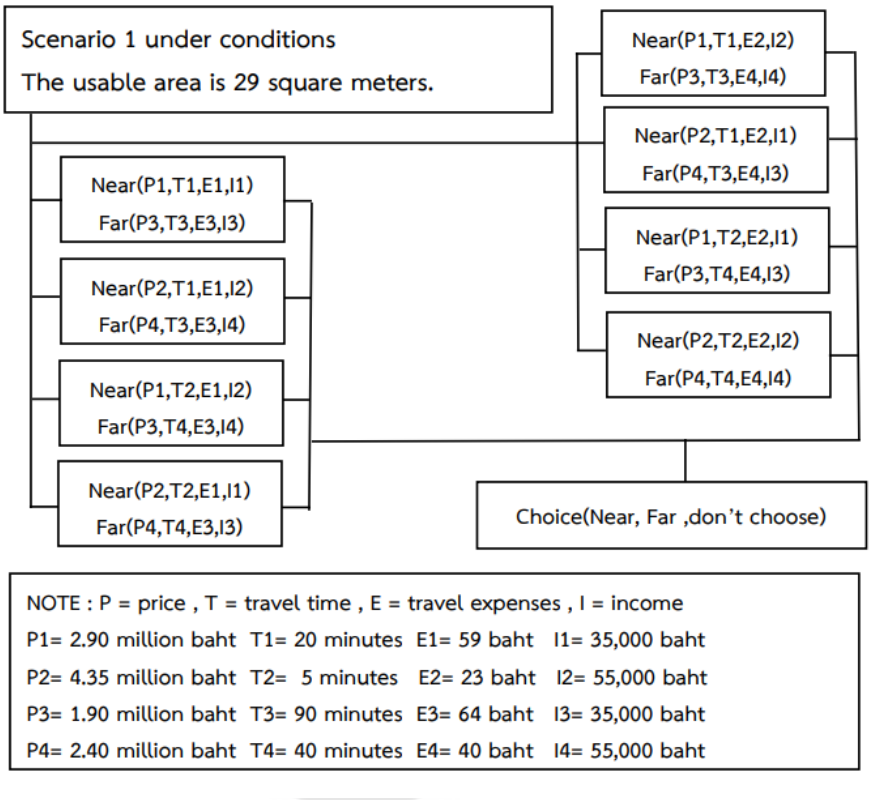


Figure 8 The residential choice decision of non-registered population under the condition in useable area

Source : Designed by the researcher

Table 15 The analysis result of the simulation under the condition useable area in condominium of marginal effect)

Number of obs 200					Log likelihood = -2,349.6514				
choice_1_Near****					choice_2_Far****				
Variable	dy/dx	Std. Err.	z	P>|z|	Variable	dy/dx	Std. Err.	z	P>|z|
price_condo	0.0090	0.0010	8.84	0.000***	price_condo	-0.0075	0.0009	-8.90	0.000***
time_travel	-0.0100	0.0004	-23.82	0.000***	time_travel	0.0016	0.0002	8.43	0.000***
exp_travel	-0.0040	0.0005	-8.26	0.000***	exp_travel	0.0042	0.0005	8.33	0.000***
income	0.0032	0.0008	4.08	0.000***	income	-0.0017	0.0004	-4.53	0.000***

Source : From the calculation

Note : **** The estimating result was compared to the third choice
(To neglect for buying)
*** refer to significant at p< 0.01
** refer to significant at p< 0.05
* refer to significant at p< 0.10

From the table 15 found that the factors that effected to the residential choice decision as condominium that was located nearby rail transit stations in significant at p< 0.01 such as; price(price_condo) was possible to decide buying the condominium increasingly averaged at 0.90. Income was possible to decide buying the condominium increasingly averaged at 0.32. Duration for traveling(time_travel) was possible to decide buying the condominium decreasingly averaged at 1.00. Expense for traveling(exp_travel) was possible to decide buying the condominium decreasingly averaged at 0.40.

According to the analysis result found that the factors that influencing to the residential location choice decision as condominium that was located distant from rail transit stations in significant at p< 0.01 such as; condominium price(price_condo) was

possible to influent buying the condominium decreasingly averaged at 0.75. Income was possible to influent buying the condominium decreasingly averaged at 0.17. Duration for traveling(time_travel) was possible to influent buying the condominium increasingly averaged at 0.16. Expense for traveling(exp_travel) was possible to influent buying the condominium increasingly averaged at 0.42

4.5.3 The analysis result of non-registered population in the simulation 2

The analysis result by using Stated Preference (SP) was the data observation about the simulator which specified the price 3,000,000 bath per a room for the residential choice decision as condominium. There were 3 choice. 1. The residential choice as condominium where was located nearby the rail transit station. 2. The residential choice as condominium where was located distant from the rail transit stations. 3.To neglect for choice as condominium. The result could present to be in the probability of the residential choice of non-registered population in Bangkok as follow;

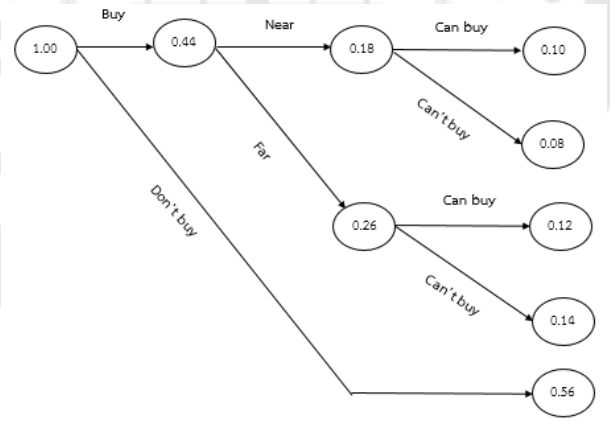


Figure 9 The residential choice decision of non-registered population under the condition in budget

Source : From the calculation

The analysis result found that non-registered population neglected to buy the condominium in the simulation averaged at 56%, and 44% of non-registered population had decided to buy the condominium in the simulation. The samples who decided to

buy the condominium where was located nearby the rail transit stations were average at 18%. The samples who were potential to buy the condominium where was located nearby the rail transit stations were average at 10%. The samples who were unable to buy the condominium where was located nearby the rail transit stations were average at 8%. The samples who decided to buy the condominium where was located distant from the rail transit stations were average at 26%. The samples who were potential to buy the condominium nearby the rail transit stations were average at t 12%. The samples who were unable to buy the condominium nearby the rail transit stations were average at 14%.

Model in research

Buy a condominium = f(room_size, dist_mall, fitness_pool, bedroom)

Where Buy a condominium was 3 of choices for the residential purchasing

room_size	was size of room sq,m.
dist_mall	was distance for traveling to shopping mall(kilometer)
fitness_pool	was fitness center and swimming pool
bedroom	was the number of bedrrom(rroms)

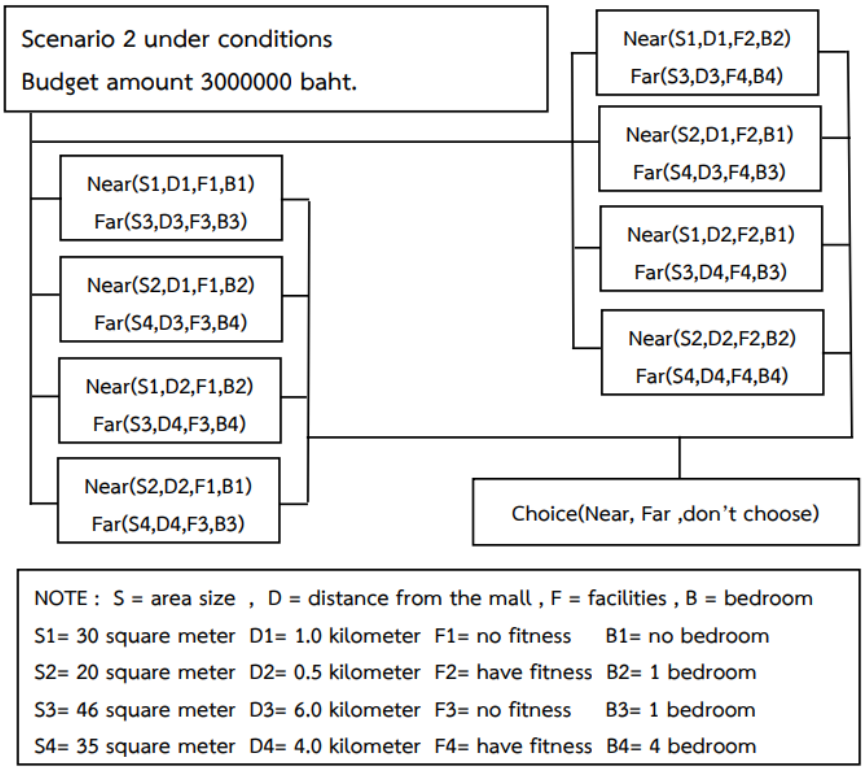


Figure 10 The residential choice decision of non-registered population under the condition in budget

Source : Designed by the researcher

Table 16 The analysis result of the simulation under the condition in budget for the residential choice as condominium of marginal effect

Number of obs 200					Log likelihood = -2,389.0785				
choice_1_Near****					choice_2_Far****				
Variable	dy/dx	Std. Err.	z	P>|z|	Variable	dy/dx	Std. Err.	z	P>|z|
room_size	0.0012	0.0006	2.24	0.025**	room_size	0.0037	0.0012	3.08	0.002***
dist_mall	-0.0787	0.0080	-9.80	0.000***	dist_mall	0.0893	0.0055	16.18	0.000***
fitness_pool	-0.0057	0.0060	-1.04	0.298	fitness_pool	0.0137	0.0149	0.92	0.355
bedroom	0.0124	0.0056	2.19	0.028**	bedroom	0.0239	0.0140	1.71	0.087*

Source : From the calculation

Note : **** The estimating result was compared to the third choice
(To neglect for buying)
*** refer to significant at p< 0.01
** refer to significant at p< 0.05
* refer to significant at p< 0.10

From the table 1 6 found that the factors that influencing to the residential location choice decision as condominium that was located nearby rail transit stations in significant at p< 0.01 such as; Distance for traveling(dist_mall) was possible to be influent buying the condominium decreasingly averaged at 7.87. the factors that influencing to the residential location choice decision as condominium that was located nearby rail transit stations in significant at p< 0.05 such as; size of room(room_size)was possible to be influent buying the condominium increasingly averaged at 0.12. The number of bedrooms(bedroom) was possible to be influent buying the condominium increasingly averaged at 1.24.

The analysis result found that the factors that influencing to the residential location choice decision as condominium that was located distant from rail transit stations in significant at p< 0.01 such as; size of room(room_size) was possible to influent buying the condominium increasingly averaged at 0.37. Distance for traveling to shopping mall(dist_mall) was possible to be influent buying the condominium increasingly averaged at 8.93. The factors that influencing to the residential location choice decision as condominium that was located distant from rail transit stations in significant at p< 0.10 such as; the number of bedrooms(bedroom) was possible to be influent buying the condominium increasingly averaged at 2.39.

4.5 The analysis results for studying the factors which had an influence to residential choice for buying the condominium where was located nearby and distant from rail transit stations by using Revealed Preference (RP)

Table 17 The analysis result of the samples for the residential choice as condominium of marginal effect

Variable	buying the condominium	**Residential choice with nearby rail transit station**
Female	-0.0966**	-0.0289
Age	0.0033	-0.0074***
Status		
Married	-0.1335	0.0130
Divorced	0.0352	0.2889***
Widow	-0.0368	0.0648
Educational Level		
Bachelor's degree	0.2443***	-0.0997***
Postgraduate	0.3184***	-0.1000
Occupation		
Company Limited employee(Public)	-0.0708	-0.1556***
Self-employee	-0.0763	-0.1232**
State Enterprise employee	0.0643	-0.1007
Company Limited employee	-0.1779**	-0.0833
Others	-0.2966**	-0.1576**
Inc	0.0327**	0.0027
hh_inc	-0.0080	-0.0007
Cars	-0.0086	-0.0239

Table 17 (Continue)

Variable	Residential choice	Residential choice with nearby rail transit station
hh_menbers	0.0722*	0.0164
freq_bts	-0.0051	0.0043
exp_bts	0.0070	-0.0050
freq_taxi	-0.0183**	-0.0120***
exp_taxi	0.0086*	0.0005
freq_cars	-0.0040	-0.0020
exp_cars	0.0001	0.0003
time_bts	-0.0002	0.0027**
time_taxi	-0.0014	0.0017*
time_cars	0.0034***	-0.00002
house_size	0.0043*	0.0011
price_sqm	-0.0182*	0.0964***
no_pool	-0.1409	-0.3019***
dist_mall	0.0228*	-0.0170**
exp_condo	0.0030	-0.0023
	AIC : 1.354	AIC : 0.713

Source : From the calculation

Note : **** The estimating result was compared to the third choice
(To neglect for buying)
*** refer to significant at p< 0.01
** refer to significant at p< 0.05
* refer to significant at p< 0.10

From the table 1 7 found that the factors that influencing to the residential location choice decision as condominium that was located nearby rail transit stations in significant at the same relation such as; people who graduated from bachelor's degree when compared to people who were in pre university degree. The residential choice decision as condominium had a marginal effect in positive which it was opposite to the residential choice decision as condominium had a marginal effect in negative for general employee (occup) when compared to the governor employee that the residential choice decision as condominium with nearby rail transit stations and location choice decision had a marginal effect in negative for the same direction. Frequency for traveling by taxi-meter(freq_taxi) which was in residential choice decision as condominium and location choice decision had a marginal effect in negative for the same direction. Price of condominium(price_sqm) had a marginal effect in negative which it was opposite to the residential location choice with nearby rail transit stations had a marginal effect in positive. Distance for traveling to shopping mall(dist_mall) had a marginal effect in positive which it was opposite to the residential choice decision as condominium where was located nearby rail transit stations had a marginal effect in negative effect.

CHAPTER 5
CONCLUSIONS, DISCUSSION, AND RECOMMENDATION

The research study “The Behavior Of Non-Registered Population For Choosing The Accommodation In Bangkok (Case Study: Condominium)” had a purpose to study the factor which influenced to the residential choice decision for purchasing and renting condominium, and the factors which effected to the residential location choice decision as condominium where was located nearby the rail transit stations and the condominium where was located distant from the rail transit stations by Revealed Preference (RP) method. Moreover, the research was to study the residential choice decision as condominium where was located nearby the rail transit stations and the condominium where was located distant from the rail transit stations with the simulations by Stated Preference (SP) method. The data were collected from respondents for 400 questionnaires, and collecting data was until March 2021 to June 2021. The questionnaires consisted with 4 parts; 1. Personal information 2. The behavior for the residential choice 3. The behavior for the residential choice in the simulations 4. The significant level for the residential choice and transportation. This chapter was presented the detail to be 3 parts; 1. Research discussion 2. Research conclusion 3. Research recommendation

5.1 Discussion

5.2.1 Descriptive Statistical Discussion

From the result found that people who chose to stay in condominium were almost averaged 33 years old and to be single. The condominium was popular in the middle age or adulthood and single which some people stayed as alone. Moreover, it indicated to the condominium was an estate that people would decide to buy for first in their life due to the condition of budget also was capable to get it for their own. People who stayed in condominium were in higher educational level when compared to the educational level of people in the country to result in the condominium administrative office would screen people before they attended. Income was the first factor that was screened for people to own the condominium whether cheap to expensive price in

condominium. So, each the condominium society was a diversity. Most of the people in condominium were official in position of work and income what they could do the financial transactions with the bank to take a loan for buying the own condominium.

The significant factor in the residential choice decision was found that safety in the residence what it relates to security policy for visitor and owner should have an authorized card for confirm to identity. If person who did not take the card, they could not be allowed to go to the room that including to the safety around the condominium. The condominium entrepreneur should make a good point in security measure in the condominium which it effects to be successful in the condominium development. Condominium price is important to choose to buy the condominium because people have a limit in budget for buying. Flood in the area is also important to decide to buy the condominium because Bangkok is in lower of sea level and it frequently happen to the flood in the raining season or heavy rain drop can result in the property such as flood covering cars. Distance for traveling from place to place is important to be the residential choice because the people consider to the convenience in transportation and they don't face with the traffic jam. Price for resell is important to sell it if they seek for the new condominium because people don't stay forever in the condominium. Hence they can transform condominium to be a profit in financial. Moreover, the people are considered to the company development because the residential choice is similar to choose the context in home and in case of the company development base the good foundation in legal entity, so the residents operate follow the condominium regulations.

5.2.2 Revealed Preference(RP) Discussion

According to study, the factors that were influent to the residential choice decision as condominium of non-registered population in Bangkok found that female tends to decide for buying the condominium less than male because male need a freedom and a privacy in the living life more than female. As a result in male decides to choose for work in distant from their hometown more than female, and more a reason that Thais' livelihood must care about female more than male in living life. The educational level(edu) has an effect on work and income. If a person is in the high

educational level, a person could receive income in higher rate, and it is influential in the residential choice decision as condominium increasingly. Wherewith, the lending from financial bank must consider to income and official duty. Moreover, people with higher educational level are potential in background position of their family, so they get special chance for buying condominium more than other people, which the study agree with studies by Carola de Groot et al. 2011. Occupation(occup) found that people who are company limited employee are insecure in income and welfare including to work position that directly affect to buy condominium in order to buying condominium is a least liquidity property and resell for long. Moreover, the lending from financial bank must consider to income and potential company, so people are not available to get the lending. Self-employee is uncertain in source of income, so people are not approved to get the lending from the financial bank. But self-employee buy the condominium with cash payment, which is similar to the study Jia Guo et al. 2020. Income(Inc) per a month indicate to capability to buy condominium because it is the main factor that people estimate to the potential condominium purchasing , and the financial bank also consider to the income for approved the lending, which the study agree with studies by Patricio E. Pe´rez et al. 2003. The number of household member(hh_menbers) affect to buy condominium in case of the potential family. People who are single consider to the potentiality less than the married people because buying condominium is similar to saving through real estate and price is increasingly follow economic circumstance, which is similar to the study Jae Hong Kim et al. 2005. Frequency for traveling by taxi-meter(freq_taxi) tends to be decreasingly when the people decide to buy the condominium where is located nearby the rail transit stations and work office because it is saved in transportation fee, which is similar to the study Jonas De Vos et al. 2020. Expense for traveling by taxi meter(exp_taxi) tends to be increasingly because most of the people require the lending from the financial bank to buy condominium. As result in people have a financial burden to pay by installment, so they don't by the own car to reduce expense and maintaining fee, which is similar to the study Gusti Ayu Andani et al. 2020. Duration for traveling by private car(time_cars) tends to be increasingly

because people choose to buy the condominium by consider to the budget that they are able to pay for it to result in people decide to buy condominium where is located distant from work office. So they are in longer transportation, which is similar to the study Jonas De Vos et al. , 2016. Size of the useable area(house_size) affects to decide to buy condominium because people need the bigger area to do activity inside the room area. Price of condominium is the important factor what people consider to decode for buying condominium because they have a limited budget. The condominium location is the first factor what people consider to choose for buy condominium, then it is condominium price, which is similar to the study Jia Guo et al. 2020. Distance from the shopping mall(dist_mall) tends to be increasingly for condominium choice decision because people go to buy consume product and food in the shopping mall, which is similar to the study Jia Guo et al. 2020.

According to the study, the factors that were influential in the residential choice decision as condominium where is located nearby rail transit stations found that age has a tendency that maturity is possible to choose the condominium where is located distant from rail transit stations because maturity has a family, and they need usable area for bigger size which the condominium where is located distant from rail station just sell in lower price per a sq,m. They can pay enough budget to buy it for bigger than the condominium where is located nearby rail transit stations. Moreover, maturity need more the privacy. The condominium where is located distant from the rail transit stations, is more peaceful than the condominium where is located near rail transit stations. Divorced tends to choose the than the condominium where is located near rail transit stations because people stay alone or self, so they could choose the condominium that respond to convenience for traveling more than the usable area., which agree with answer by the respondents in single, people with single certainly choose the condominium by hold on from convenience in traveling more than usable area, which the study agree with studies by Jonas De Vos et al. 2020. People with bachelor's degree and finish studying(edu) will receive a least salary that not enough to buy the condominium nearby rail transit stations due to the condominium price is higher than the salary base

what beyond to request the lending from the financial bank. They choose to buy the condominium where is located distant from rail transit stations instead of the condominium nearby rail transit stations cause of lower price. In case of renting condominium, price for renting condominium where is located nearby rail transit station is higher than the condominium where is located distant from rail station. Price for renting condominium where is located nearby rail transit station is equal to the price for pay in the lending to get own condominium with distant from rail station but if people buy the condominium, it could be the owned property, which the study agree with studies by Carola de Groot et al. 2011. Company limited(Public) employee(occup) is official in the duty including to good welfare to support them and people are able to buy the condominium where is located nearby rail transit stations but their income is at least for 35,000 bath per month. The beginner in company limited(Public) employee will receive salary on based, they could not buy it, which the study agree with studies by Jia Guo et al. 2020. Self-employee and other occupation are unsecured with income so that effect to choose for rent condominium to save the cost. People collect the cost to buy the condominium with cash but it is difficult to do for that, which the study agree with studies by Jia Guo et al. 2020. Frequency for traveling by taxi-meter(freq_taxi) tends to be decreasingly because people consider to choose the condominium where is nearby rail station to reduce to cost in expense for traveling, which the study agree with studies by Jonas De Vos et al. 2020 Duration for traveling from work office by rail transits(time_bts) tends to be increasingly because people need a convenience in traveling and the alternative choice for condominium with nearby the rail station so effect to people could estimate for real time in traveling and they don't interact with traffic jam, which the study agree with studies by Chaug-Ing Hsu et al. 2006. Duration for traveling to work office by taxi-meter(time_taxi) tends to be increasingly because people pay more rents and expense for own condominium so effect to reduce the expense traveling to instead of traveling by public transportation, which the study agree with studies by Chaug-Ing Hsu et al. 2006. Condominium price, condominium with nearby rail station is higher than condominium with distant from rail station. People consider to choose the condominium

from the location and resell, so it is famous in trend and as result to high profit when they take resell in the future although the lending rate is as equal as , which the study agree with studies by Jae Hong Kim et al. 2005. Condominium is no swimming pool(no_pool) revealing that if there is a swimming pool in the condominium, people can use for exercise. Because the people need more facilities in the condominium. Distance for traveling to the shopping mall tends to be increasingly because people don't estimate time and it is convenient to travel to shopping mall and any place from condominium with nearby rail transit stations, which the study agree with studies by Jia Guo et al. 2020.

5.2.3 Stated Preference(SP) Discussion

According to study, the factors that were influential in the residential choice decision as condominium of non-registered population in Bangkok by using Stated Preference (SP) could discuss the result as follow; The simulation with condition about residential choice decision for 1 room with size of the useable area 29 sq,m which reveal that the behavior studies for payment decision found that non-registered population decide to choose the condominium where is located nearby rail transit stations more than the condominium where is located distant from rail transit stations because it is convenient and rush in the traveling more than traveling by the car. From the data collection by questionnaire revealed that traveling by the rail transits is precise on the estimation more than traveling by the car. The findings estimation found that most of the non-registered population decide to buy the condominium where is located nearby rail transit stations for the same following as income. If the people have enough income to buy the condominium with nearby rail station, those who tends to be increasingly to buy the condominium where is reach into rail station. Moreover, people consider in the residential choice decision about duration and expense for traveling due to duration is wasted of time that they can take these time to do any activities in more benefit. Expense for traveling is the cost in daily. If people buy the condominium where is nearby rail station, it effects to decreasingly the cost for traveling and waste time to be a

condominium compensation to the reason for condominium with nearby rail transit stations is higher price than the condominium with distant from rail station.

The simulation with under condition of limited budget about residential choice decision for 1 room with condominium price is 3,000,000 bath which reveal that the behavior studies about the convenience in life which has been changed follow the size of room and the facilities by defining condominium price is stable found that non-registered population decide to choose the condominium where is located distant from rail transit stations more than the condominium where is located nearby rail transit stations because the condominium with distant from rail transit stations is served the bigger size of area and room size more than the condominium with nearby rail transit stations. Price of condominium with distant from rail transit stations is cheaper than price of condominium with nearby rail transit stations. The findings were found that non registered population tends to be increasingly to buy the condominium with size of condominium which reveal to the limited budget. People are pleased to pay for the condominium with bigger usable area instead of buying the condominium with nearby rail station because they could do any activities in bigger area. People accept in condition about gathering the convenience instead of traveling. Moreover, people who buy the condominium with nearby rail transit stations are unpopular to the condominium where is located nearby the shopping because they can travel by rail transits line. It is such a difference from people who buy the condominium with distant from rail station because of unnecessity in traveling to shopping mall. The traveling is as convenient as for each other. For the number of the bedrooms, people are interested in the condominium where contain with the private bedroom more than common bedroom because the condominium with private bedroom served a privacy and support for the number of member if the member is increasingly to stay in the room in the future

According to the analysis result, the studies found that Stated Preference (SP), which the study agree with the influential factor in the residential choice decision studies. For the simulation under the usable area condition found that the factors include to condominium price, duration for traveling, expense for traveling, and income were

agreed with statistical significant in the decision. For the simulation under the budget for buying condominium condition found that the factors include to size of room, distance from shopping mall, fitness center and swimming pool were agreed with statistical significant in the decision. Hence, Stated Preference (SP) and Reveled Preference (RP) are also agree with the studies. If the research is operated in the future, the researcher could take the studies with Stated Preference (SP) to define the policy in the public and private unit for the benefit and the practice

5.2 Conclusion

This research has operated and analyzed the data from the questionnaires which the research conclusion is categorized for 3 parts as follow; 1 Preference of people who decide to buy the condominium. 2 Population gap between non-registered population and people who are used to be non-registered population before. 3 The tendency changes about non-registered population to be Bangkokian.

5.2.1 Preference of people who decide to buy the condominium.

From the research study found that residential choice decision as condominium hold on the factors as follow; 1 Safety in condominium space 2 Price of condominium(room) 3 The area of condominium is no flood 4 The area is no protest 5 Resell price for the future. From the factors, people consider in the residential choice decision as condominium for own that they compare the information from the research data. If they decide to choose the location of condominium first, then they would choose the condominium project for later. The condominium development and company is the one of factor that purchaser believe and trust in the company for good management.

The data about residential choice as condominium , there are people who are almost 35 years old, decide to buy the condominium where is located nearby rail transit stations. They get with high income. The people who decide to buy the condominium where is located distant from rail transit stations are the runner up of income. These people are stable in their work and they could work throughout for life. Furthermore, the condominium purchaser have ever been in good financial from their parents or family blood.

In addition, the research studies by using Stated Preference (SP) which it is created the simulations to the respondents found that condominium purchasers choose to buy the condominium where is located nearby rail transit stations which the factor about price of condominium could only make a changes to buy the condominium where is located distant from rail transit stations. The simulations are created by defined the condition in price is 3,000,000 bath per a room of all simulations. The findings is found that the purchasers place to buy the condominium where is located distant from rail transit stations more increasingly because it serves the usable area and room space are bigger than the condominium where is located nearby rail transit stations. It is also said that the condominium purchaser considers to buy the condominium where is located nearby rail transit stations for the first, then price of condominium and size of room are sequence.

5.2.2 Population Gap between non-registered population and people who are used to be non-registered population before.

From the research study found that there are 2 group of people are similar to be in age and educational level, but other aspects are differently yet not much. Non-registered population who rent the condominium where is located nearby rail transit stations, have income average for 38,630 bath per a person, and non-registered population who rent the condominium where is located distant from rail transit stations, have income average for 26,177 bath per a person. Once comparing to people who are used to be non-registered population before, have income average for 55,212 bath per a person, and people who choose to buy the condominium where is located distant from rail transit stations, have income average for 41,866 bath per a person. People who are used to be non-registered population before, have income average is higher than non-registered population. The first group of higher income choose to buy the condominium where is located nearby rail transit stations, and the second group people choose to buy the condominium where is located distant from rail transit stations. For the third group, people choose to rent the condominium where is located nearby rail transit stations, and the last group with people who have the lowest income choose to rent the condominium

where is located distant from rail transit stations. In occupation, the research findings found that non-registered population are stable in their work less than people who are used to be non-registered population before. The dynamic in work could make non-registered population do not brave to decide for buying the condominium for own. Moreover, the research findings found that the financial position of non-registered population and their family is in moderate, but people who are used to be non-registered population before, have a financial position in higher level. So it is also said that the financial position of family could be the reinforcement to buy the condominium. If the purchaser and family are in high financial position, the condominium purchaser could be supported from their parents to buy condominium, for example they will buy condominium for the family member. Another reason is indicated to people who are used to be non-registered population before, have a financial position higher than non-registered population is the car average. People who non-registered population before certainly decide to buy the condominium where is located nearby rail transit stations. They are in first of car average group. When the income average for 55,212 bath per a person is considered, it is difficult that they buy the private car and condominium at the same time. Another findings found that expense for traveling of non-registered population is less than people who are used to be non-registered population before due to non-registered population choose to travel by public bus cause the travel fee by public bus is cheaper than rail transit.

5.2.3 The tendency changes about non-registered population to be Bangkokian.

From the research study found that non-registered population who change to position to be Bangkokian that is from the occupation. They are in potential of work and they could work throughout to the retire for such as the state enterprise, the government sector, the public company(Limited), the company limited. As result to non-registered population change the house registrar from their hometown to be in Bangkok registrar office. Income is the one of factor that non-registered population consider to buy or rent the condominium. From the research found that non-registered population who have high income decide to buy the condominium where is located nearby rail transit stations,

and the second group people choose to buy the condominium where is located distant from rail transit stations. For the people who have the loweer income choose to rent the condominium instead of buying condominium for own. The status of non-registered population also affect to the residential choice decision as condominium. If they are single, they decide to buy the condominium more simple than the couple or marriage. This is a cause that they change the position from non-registered population to be Bangkokian. Non-registered population who are in single, do not have any burden to return for work in their hometown.

The research study by using Stated Preference (SP) has observed non-registered population who decide to change the position to be Bangkokian found that non-registered population who decide to change the position to be Bangkokian to account for 44.00. The simulator which was under the condition of useable area for the residential choice decision as condominium; 1 room with 29 sq,m. of the useable area, the samples who choose the condominium where is located nearby rail transit stations to account for 28.00, and the samples who choose the condominium where is located distant from rail transit stations to account for 16.00. The simulator which specified the price 3,000,000 bath per a room, the samples who choose the condominium where is located nearby rail transit stations to account for 18.00, and the samples who choose the condominium where is located distant from rail transit stations to account for 26.00 which is related to the study by using Revealed Preference (RP) found that non-registered population certainly choose the condominium where is located nearby rail transit stations.

Furthermore, the study found that non-registered population before and non-registered population are average at 33 years old that show to the tendency of people after they graduated, they decide to work continually in Bangkok more than they return to work at their hometown or other provinces. These are reasons that non-registered population decide to change the position to be Bangkokian as follow; 1) The higher education institutions or university are almost located as the main campus in Bangkok. So the students who are from oyher province, live in Bangkok throughout graduation.

They are accustomed for using of living life in Bangkok more than they change to the new city. 2) Work position. Bangkok is the center of dominating government and business of Thailand, so there are many work positions in either government departments or public sectors in Bangkok. Not only the government but the main public company offices are also located in Bangkok. According to the mention, there are many work position either the government or public sectors which it is related to the statistic of department of domination found that the number of population in other provinces are decreasingly in past that is opposite to the number of population in Bangkok and sub provinces which is increasingly so on. 3) The behavior in living life for today(the present) has changed from the past. Today, people who have an educational degree could have the own family when they reach into the elder, and they decide to have a few children in their family. Someone decide to be in single as result to residential choice decision as condominium is more popular, Because the condominium project could respond to behavior in living life such as convenience and facilities, fitness center and swimming pool, safety system, and simple traveling mode. 4) Convenience and facilities in Bangkok that agree to diverse of its such as shopping mall, entertainment complex, traveling mode with public transportation, and taxi-meter. Ither provinces do not have enough for convenience and facilities as Bangkok as. People are favorite to stay in the modern area with convenience and facilities. This is a cause to non-registered population decide to change by themselves to be Bangkokian.

5.3 Recommendation

5.3.1 Recommendation from this research

1 . The real estate development and company must select the area of project ro consider in the fundamental factors that the purchaser pay attention for the condominium as follow; 1) safety in the area of the condominium site and development. It is important to purchasers aware in their life and property including to safety processing inside the condominium projects. 2) Price of condominium is important to residential choice decision for condominium of non-registered population. The condominium enterpriser should be clearly in the goal to define who the customer or

residents of the projects are in the level of income in order to choose the suitable area for condominium site and development. 3) There is no flood in the area of project. It is possible to face this problem in the future because Bangkok is located below of the sea level. The condominium enterpriser should select the area where is out of the flood. 4) The area is no the protest. 5) Resell price that the enterpriser must consider to select the potential area that result to price is going to be increasingly for sell in the future. Moreover, the enterpriser create a good corporate image to customers believe in the company and good in after sales service. For these reasons. Its are important to residential location choice to develop the condominium project. In addition, the enterpriser must corporate with other companies or agencies where the non-registered population were related in working and financial agencies. Thus, the corporation makes staff to receive the priority about buying condominium from the condominium partnership. This is a reinforcement for purchaser to get condominium for own more easily from the priority.

2 . The condominium development enterpriser must launch the policy in the exchange condominium- taking the old for new owns, the company buy old condominium of redemption market for people who want to buy the new condominium for own. It is a making income for the company when the new project has launched to the market, and the old condominium from buying could be renovated for the resell. The guarantee price for buying returns policy in the condition with definitely price and time in order to purchasers are comfortable in the condominium purchasing that they are not concerned with losing ib funds. This is more increasingly customers who are not stable in occupation or customers who are concerned in the risks, but they want the condominium to be own for staying. They could be braved more easily for residential choice decision. Moreover, the condominium development company must provide the new agency to take care of the customer who need to launch the room for rent or resell which the agency could do the transaction instead of the room owner. The agency will receive a commission from rents and sells. Either of the condominium development company and the purchaser also get the benefit from this policy together.

3 . From the research study, the findings was found that the condominium purchaser choose the location where is located nearby rail transit stations at first that the condominium enterpriser must also select the location or area of the condominium site to respond for customer's needs and non-registered population. The purchasers are pleasured to buy the condominium where is located around the sub urban but it is certain nearby rail transit stations that placing to buy the condominium in the urban area where is located distant from rail transit stations. This is important for condominium enterpriser must aware in the condominium project and show the prominent point in size of room and car service from the condominium to rail transit stations.

4. The government should launch the policy about the corporation between National Housing Authority and the condominium development company to provide the area where is nearby or distant from rail transit station for the condominium site which is the reasonable price for non-registered population who get the total income lower than 25,000 bath, and the government must persuade the financial governor agency such as GH Bank, Government Saving Bank to take a credit to people who are in the lower income or self-employee who are not stable in their receiving income. Furthermore, the financial bank should launch the policy about returning for loan payment that is over a credit limit each month, then the balance of payment could be withdrew for the emergency chance. This policy persuade people who pay for installment to affect that decreasing the burden of rate, and people are confident to the remaining balance for use if the emergency case is happened.

5. The government is necessary to launch the policy about the assistance to the people with lower income for getting the residence for own by the owned first house in life that also include to the new house and the second hand house. The policy is to support and give the assistance about rate of loan, for example, there is a financial amount for 1,000,000 bath at first time to account rate is equal as a financial fixed deposit for 1 year and add to rate at 0.75 of loan rate if a financial amount is more than 2,000,000 bath, so the accounting rate is general rate. This policy is able to decrease the gap of the class society in the financial installment of burden, and it is suitable to Thailand which there is a financial deposit to be full of bank procedures. In addition, this is the economic stimulation for progression,

6. The government should call for the revenue of vehicle(private car) registrar tax more increasingly, then revenue or tax from the collection of registrar to support for transportation fee to result in the cheaper fee for transportation. This is suitable

to the people who get a wage at least for 331 bath per a day, could travel from sub urban to district by rail transit system. It is the financial distribution from the people who are high class society to support the people who are lower class society through the collecting tax payment.

7. The government must launch the policy about separating the capital town or the economic city which the government should relocate all governor agencies to the new site in Pathum Thani or Chachoengsao, and the government should develop the transportation to connect with Bangkok. It is a distribution to other provinces in order to decrease the population density in the capital town. The government should promote the university to expand or move to the new site in other provinces or sub urban province, for example Sri Nakharinworot University is moved to locate in Nakhonnayok or Mahidhol University is moved to the new campus in Nakhon Pathom. As result in the population density in Bangkok is distributed, and the students are saved in their cost about creations and residence. The students could pay for the tuition fee for least. The university site could be adapted to be the business site by releasing for rents to public business company or making the site to be hospital for support the patient that is increasing rate with cause from the number of students is decreasingly, but the number of elders and patients is more increasingly in the future.

8. The government should develop the rail transit system by connecting the rail transit lines to Samut Prakan, Nonthaburi, and Pathum Thani for dispersion into the sub urban. Due to the shopping mall, Public company office, and condominium site are built and located along to the rail transit lines, then the rail transit lines could make the area to be civilization. Non-registered population choose to buy the condominium where is in sub urban, and they travel into the district by rail transit. The population density in Bangkok is decreasingly following to the rail expansion. The government in transportation sector should provide the funds to support the rail transit fee which the government can collect the vehicle tax from people who have luxury cars, to support the rail transit enterprise. People who receive in lower wage could with travel rail transit to work and to be saved the expense in their life.

5.3.3 Recommendation for the later research

1 . To study with population (Bangkokian) who decide to buy and rent the condominium in Bangkok in order to compare with the result of non-registered population, and people who used to be non-registered population.

2 . To study the company development in condominium company(public) and condominium entrepreneur(general) in the country for educate the factors that influencing to the image corporation and the credibility for the residential choice decision as condominium.

3 . To study the factors that effect to invest for resell and rent condominium in Bangkok and to compare the investor between the purchaser for solve the problem about the speculation in the real estate.

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Appendix

Table 18 The non-registered population in Bangkok

Unit : million people

Year	2014	2015	2016	2017	2018	2019
Bangkok	2.13	2.37	2.07	2.03	2.05	2.27
Percentage	32.13	32.62	29.78	30.01	30.46	32.85
Including the country	6.63	7.19	6.95	6.75	6.73	6.91
Percentage	100.00	100.00	100.00	100.00	100.00	100.00

Source : Summary of important results latent population,
National Statistical Office Thailand (2020)

Table 19 The number of commuter population in Bangkok

Unit : million people

Year	2014	2015	2016	2017	2018	2019
Bangkok	0.11	0.12	0.15	0.17	0.11	0.13
Percentage	9.40	9.34	11.63	12.88	9.32	11.71
Including the country	1.17	1.28	1.29	1.32	1.18	1.11
Percentage	100.00	100.00	100.00	100.00	100.00	100.00

Source : Summary of important results latent population,
National Statistical Office Thailand (2020)

Table 20 Statistics of condominium registration in Bangkok

Unit : Room

Year	2555	2556	2557	2558	2559	2560	2561
number of rooms	28,949	50,602	44,208	41,186	41,859	34,490	56,602
Percentage	-0.36	74.80	-12.64	-6.84	1.63	-17.60	64.11

Source: Real Estate Business Promotion Office, Department of Lands

Table 21 The categorized data from 400 questionnaires of respondents

Variable	Obs	Mean	Std.Dev	Min	Max
Female	400	0.5875	0.4929	0	1
Age	400	33.6275	7.8276	19	63
Married	400	0.3500	0.6070	0	3
Edu	400	1.0100	0.4695	0	2
Occup	400	2.5950	1.5660	0	5
Inc	400	4.0471	4.4422	1.40	50.00
hh_inc	400	6.0985	0.7150	1.40	100.00
Cars	400	1.5575	0.7150	0	5
hh_menbers	400	1.5575	1.0976	1	7

Source : The data was from the questionnaire

Table 22 Data classification of respondents of 100 questionnaires of condominium buyers near rail transit stations.

Variable	Obs	Mean	Std.Dev	Min	Max
Female	100	0.5300	0.5016	0	1
Age	100	33.8600	7.0439	22	63
Married	100	0.3500	0.5573	0	2
Edu	100	1.1600	0.4654	0	2
Occup	100	2.3300	1.4911	0	5
Inc	100	5.5212	5.6182	1.40	40.00
hh_inc	100	8.9183	13.8792	1.40	83.00
Cars	100	1.1600	0.8254	0	4
hh_menbers	100	1.7100	1.2496	1	5

Source : The data was from the questionnaire

Table 23 Data classification of respondents of 100 questionnaires of condominium buyers distant from rail transit stations.

Variable	Obs	Mean	Std.Dev	Min	Max
Female	100	0.5300	0.5016	0	1
Age	100	35.6600	7.8769	23	60
Married	100	0.4300	0.7000	0	3
Edu	100	1.0600	0.4221	0	2
Occup	100	2.3000	1.5538	0	5
Inc	100	4.1866	5.6268	1.50	50.00
hh_inc	100	6.5856	13.9727	1.50	100.00
Cars	100	1.0300	0.5938	0	3
hh_menbers	100	1.6700	1.2395	1	7

Source : The data was from the questionnaire

Table 24 Data classification of respondents of 100 questionnaires of condominium tenants near rail transit stations.

Variable	Obs	Mean	Std.Dev	Min	Max
Female	100	0.6100	0.4902	0	1
Age	100	32.26	8.1434	19	55
Married	100	0.3700	0.6139	0	3
Edu	100	0.9600	0.4477	0	2
Occup	100	2.9900	1.5731	0	5
Inc	100	3.863	3.3129	1.50	20.00
hh_inc	100	5.7880	7.9967	1.50	50.00
Cars	100	0.95	0.8689	0	5
hh_menbers	100	1.57	1.1033	1	7

Source : The data was from the questionnaire

Table 25 Data classification of respondents of 100 questionnaires of condominium tenants distant from rail transit stations.

Variable	Obs	Mean	Std.Dev	Min	Max
Female	100	0.6800	0.4688	0	1
Age	100	32.73	7.8764	19	56
Married	100	0.2500	0.5389	0	3
Edu	100	0.8600	0.4928	0	2
Occup	100	2.7600	1.5578	0	5
Inc	100	2.6177	1.0085	1.50	8.00
hh_inc	100	3.1050	1.6811	1.50	10.00
Cars	100	0.84	0.4654	0	3

Table 25 (Continue)

Variable	Obs	Mean	Std.Dev	Min	Max
hh_menbers	100	1.28	0.6526	1	4

Source : The data was from the questionnaire

Table 26 The traveling for work information

Variable	Obs	Mean	Std.Dev	Min	Max
freq_bus	400	3.4250	6.9869	0	28
exp_bus	400	1.6917	4.0517	0	24
freq_bts	400	6.4500	9.0217	0	28
exp_bts	400	5.1833	8.0755	0	52
freq_taxi	400	2.7450	5.1945	0	28
exp_taxi	400	4.0904	9.4384	0	100
freq_cars	400	14.3375	10.7360	0	30
exp_cars	400	21.0620	27.4045	0	280
time_bus	400	10.4975	22.5846	0	120
time_bts	400	12.6900	19.0627	0	120
time_taxi	400	12.8625	23.2507	0	120
time_cars	400	29.5700	24.7681	0	90

Source : The data was from the questionnaire

Table 27 The residence information

Variable	Obs	Mean	Std.Dev	Min	Max
house_size	400	33.9525	9.8192	20	69
price_sqm	400	8.5611	3.2907	2.3	18
Floors	400	21.0250	11.0222	2	46
no_fitness	400	0.0375	0.1902	0	1
no_pool	400	0.0550	0.2283	0	1

Source : The data was from the questionnaire

Table 28 Information regarding the location of the respondents residence

Variable	Obs	Mean	Std.Dev	Min	Max
dist_bts	400	1.4056	1.6569	0.10	10
dist_bus	400	0.6515	0.7840	0.02	5
pop_density	400	7.0825	3.5134	1.52	45.42
no_university	400	0.6575	0.4751	0	1
no_hospital	400	0.4300	0.4957	0	1
freq_mall	400	4.8950	4.9457	0	30
dist_mall	400	2.5576	1.7600	0	8
no_tollway	400	0.5750	0.4950	0	1
exp_condo	400	40.3625	10.7699	10	79

Source : The data was from the questionnaire

Table 29 Data in The Simulation 1 of the respondents

Variable	Obs	Mean	Std.Dev	Min	Max
price_condo	200	28.8750	9.1555	19	43.50
time_travel	200	33.6875	29.9248	5	90
exp_travel	200	50.0000	15.9869	23	64
income	200	45.0000	10.0016	35	55

Source : The data was from the questionnaire

Table 30 Data in The Simulation 2 of the respondents

Variable	Obs	Mean	Std.Dev	Min	Max
room_size	200	32.7500	9.3656	20	46
dist_mall	200	2.8750	2.2469	0.50	6
fitness_pool	200	0.5000	0.5001	0	1
Bedroom	200	1.0000	0.7072	0	2

Source : The data was from the questionnaire

Table 31 The categorized significant about the purchasing condominium of the respondents

Variable	Obs	Mean	Std.Dev	Min	Max
condo_price	400	4.4425	0.7197	2	5
travel_expen	400	4.0500	0.9081	1	5
distan_work	400	4.1625	0.8764	1	5
near_station	400	3.9150	0.9327	1	5
public_tran	400	3.5650	1.0880	1	5
number_house	400	3.5600	0.9817	1	5

Table 31 (Continue)

Variable	Obs	Mean	Std.Dev	Min	Max
pop_density	400	3.5400	0.8974	1	5
distan_mall	400	3.4875	0.9835	1	5
size_condo	400	4.0875	0.8009	1	5
fitnes_pool	400	4.0825	0.8381	1	5
safety_condo	400	4.6325	0.5773	2	5
resale_price	400	4.1225	0.8969	1	5
rental_price	400	3.9200	0.9142	1	5
develop_company	400	4.1150	0.8681	1	5
area_no flood	400	4.2850	0.9197	1	5
area_no proteste	400	4.0700	1.0877	1	5

Source : The data was from the questionnaire

Journal Article : Factors influencing the choice of housing among non-registered population in Bangkok : A case study of condominium.

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FACTORS INFLUENCING THE CHOICE OF HOUSING AMONG NON-REGISTERED POPULATION IN BANGKOK: A CASE STUDY OF CONDOMINIUM

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ABSTRACT

The purpose of this research was to study the factors influencing the choice of accommodation among the non-registered population on condominium type residences in the Bangkok area using primary data from the survey research collected from March 2021 to June 2021, with the application of the Stated Preference (SP) and Revealed Preference (RP) methods.

The results of a study of factors influencing the purchase of condominiums of the non-registered population by stated preference (SP) methodology found that in simulated scenarios under the conditions of living space size restrictions, in case of purchasing condominiums near sky train stations, factors with a statistically significant level of 0.01 were price_condo and income had a positive influence. On the likelihood of purchasing a condominium along the mass transit lines, time_travel and exp_travel had a negative influence on the probability of purchasing a condominium along the mass transit lines. Under budget constraint for buying condominiums near BTS stations, factors with a statistically significant level of 0.01 were dist_mall had a negative influence on the probability of purchasing condominiums along the mass transit lines, while factors affecting statistically significant level at 0.05 were room_size and bedrooms has a positive influence on the probability of purchasing condominiums along the mass transit lines. In the Revealed Preference Methodology Study (RP), factors that influence the decision to purchase condominium housing at a statistically significant level of 0.01 are individuals with a bachelor's and postgraduate degrees (edu), positively influencing the probability of deciding to purchase a condominium compared to undergraduately educated individuals, and the duration of travel by private car to work (time_cars) positively influences the probability of deciding to buy a condominium. Statistically significant level of 0.05 include females having a negative influence on the probability of deciding to buy a condominium compared to males, individuals whose occupations work in limited companies and general hire occupations (occup), negatively influence the probability of deciding to buy a condominium compared to a person who has a career in government, monthly income (inc), positive influence on the probability of deciding to buy a condominium, and the number of personal hire cars (freq_taxi), negatively influence the probability of deciding to buy a condominium. Factors with a statistical significance level of 0.10 include the number of household members (hh_menbers), the cost of using a private hire car (exp_taxi), the size of residence (house_size), and the distance from residence to shopping mall (dist_mall), positively influencing the probability of deciding to buy a condominium, while the housing price per square meter (price_sqm) negatively influences the probability of deciding to buy a condominium. From the analysis of the results, the Stated Preference (SP) and the Revealed Preference (RP) study revealed that the factors of accommodation price, travel time, travel expenses, monthly income, residential size, and distance from residence to shopping mall resulted in negatively effect of choosing to buy condominium. It was concluded that the results of both SP and RP were consistent in the study of factors affecting on the decision-making. Choosing to buy condominium type residences where the SP study results have shown can be put to practical use. As for making policy recommendation to the government sector and real estate operator.

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Keywords: Non-Registered Population, Condominium, Stated Preference, Revealed Preference

INTRODUCTION

Bangkok is the capital city of Thailand. There are many government departments located in the Bangkok area. For this reason, Bangkok has become an economic and commercial center. The study implicitly made Bangkok the most densely populated province in Thailand, with large numbers of people from the provinces moving to live in the area. In such areas, there is a large amount of employment, resulting in the population in the provinces migrating to find work in the Bangkok area, and making people moving to live in the Bangkok landscape. The purpose of the stay in Bangkok includes further education, The non-registered population is a resident in Bangkok whom often necessary chooses a residential location in Bangkok, In choosing a residential location for the non-registered population, currently most Bangkok residential properties are developed into condominium formats. It has been found currently that land prices in the Bangkok area are revealed to be so expensive that those who want to buy housing do not have the financial ability to buy a household in urban areas, thus resulting in the habit of buying houses and changing to condominiums instead, since it is cheaper to buy these types of places to live in.

In addition, nowadays, the behavior of people's housing selection has changed from the past, where the behavior of the general public prefers to choose housing type of residency that is more of a condominium style housing; resulting in real estate operators creating a large number of condominium projects to meet the needs of those who want to buy condominium types of residence. The non-registered population whose domicile is outside the Bangkok area will be one group that has a desire to buy condominiums and another group of the non-registered population who has a desire to rent a place in the Bangkok area as well.

For this reason, there's an interest to study the factors influencing the choice of housing with the non-registered population in Bangkok who rent condominiums and then decide to buy condominium-type residences in a simulated scenario. The Stated Preference method was used to analyze the behavior and location of the non-registered population in Bangkok and to study the factors influencing the selection of the former non-registered population and the present. The factors affecting the decision-making behavior in choosing accommodation and location help make policy recommendations to the government sector and real estate operators.

Objectives

1. To analyze the factors affecting the decision to buy condominiums of the non-registered population in Bangkok by using Stated Preference (SP) method.
2. To analyze the factors affecting the purchase decision of the former non-registered population and the rental of the non-registered population in the condominium category in Bangkok by using the Revealed Preference (RP) method.
3. To analyze the factors affecting the moving of residence of people domiciled in the provinces. change to choose to live in Bangkok.

LITERATURE REVIEW

There are two types of study methods used to study the behavior of choosing the accommodation of the general public (Jacobsen ,2014): RP and SP. The RP study is an observational method of the behavior of the interested population. The RP study can be divided into the Hedonic Pricing Method and the Travel Cost Method. The RP is limited in the study of the decision-making behavior of individuals because it cannot be used to study the behavior of decision-making in housing that is not available in the housing market in relation to that area.

The SP method is to find willingness to pay when the residence or environment changes, which assumes a hypothetical situation for those who will decide to buy condominium housing

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in various events. This can be divided into studies with SP methods, including event fictitious methods and experimental methods of alternative behaviors, for example, by way, SP has been developed to correct the shortcomings of RP methodology studies, which the SP method can be used to study the behavior, deciding the housing of interested and flexible populations in the study. It is also commonly used in the study of unprecedented alternatives to policy decision-making by SP. It is criticized for its use in simulations where the actual behavior cannot be observed. However, the SP method can be used to measure non-use behavior in housing selection and can be used for studying factors that change with other attributes that are changing simultaneously. The main factors affecting the change in demand are income levels, prices for complementary or substituting goods, tastes, number of buyers and expectations about future price changes (Alia ,2018). However, study participants should be careful about the different bias due to the behavior of respondents and in data collection.

The selection behavior experiment was to determine the willingness to pay when the location of residence and amenities changed, with hypothetical scenarios to allow the interested population to make more informed choices. In this study, several alternatives could be assessed simultaneously, in which the hidden cost of the features that make up the accommodation choice could also be found. The aggregate decision-making of the change in the characteristics of the accommodation can be the main basis of choice, which is the random preference theory, whereas the satisfaction function is randomly characterized by the accommodation decision-makers. Each individual is exactly the same, but may decide to choose different accommodation under the same circumstances. Under which the same accommodation the decision-maker may decide to purchase different accommodation at different times, in which selection is available where the home buyer decides to purchase the property in an option that maximizes the utility within the constraints of the homebuyer in terms of time and income (Thurstone ,1927). Also, the theory of demand is with the housing characteristics, whereas the buyer's satisfaction with the purchase of the dwelling depends on the properties of the residential place (Lancaste ,1966). In the study done by alternative experimental methods, residential decision-makers choose shelters with the highest satisfactory characteristics, with all options indicating the level of utility consisting of two parts: deterministic element or systematic component and unexplained part (Stochastic Element or Random Component) (Adamowicz ,1998).

The choice of a person's residence is based on the concept of consumer behavior influenced by factors (Christopher, 2008). This has been applied by consumer behavior concepts in research to lead to the search for factors that affect the decision to choose accommodation in housing choices for the next population.

METHODOLOGY

This is a survey research study, in which the populations studied are divided into 2 groups: 1. The non-registered population demographic in Bangkok residential condominiums for objective analysis, one is the primary data of 200 samples, and 2. The demographics used to be former non-registered populations in Bangkok and non-registered populations in Bangkok for analysis of objective where two are a primary data of 400 samples.

The research tool was a questionnaire. Data were collected from the sample group who wanted to study the factors affecting the selection of condominium accommodation of the non-registered population in Bangkok. and the sample group who used to be the former non-registered populations in Bangkok who choose to buy condominiums. The structure of the questionnaire consists of 4 parts as follows: 1. Personal information of the respondents 2. Information on behavior in choosing the accommodation (RP) (Marcel ,1966). It includes travel information, residential information, residential location information and information on housing expenses. 3. Behavioral information on choosing a residence in a scenario (SP) (Thomas ,2003) It consists of a simulation under the conditions of space constraints and a

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scenario under the constraints of the budget for the purchase of a residence. 4. Satisfaction in choosing accommodation and travel (Earl,2010).

The data obtained from the questionnaire was obtained from the questionnaire of the target sample to decide on a residence based on the scope of a defined research study that separated the method of data collection into two population samples:

1. The non-registered population in Bangkok was used to analyze the effects of both SP and RP. The SP data collection was a survey of decision-making data under unprecedented situations that would create a simulation. Choose, which will create a scenario to choose from in a variety of alternatives based on two hypotheses: a simulation under the size constraint of living space and a simulation under the budget constraint of buying a home using an econometric method of estimating with a multinomial logistic regression (MLR) model, as shown in the simulation structure of Figure 1 below.

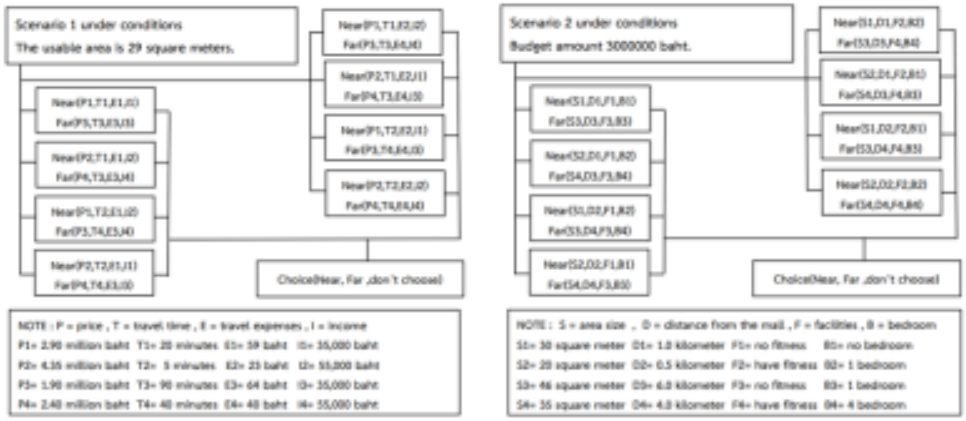

FIGURE 1
SHOWS THE STRUCTURE OF THE SCENARIO IN CHOOSING A RESIDENCE UNDER TWO CONSTRAINTS

Source: Design Researcher

2. The population that used to be the non-registered population in Bangkok and the former non-registered population in Bangkok had the data collected with the RP method, which is a survey of information about purchasing and renting condominium-type residences in Bangkok by using the econometric analysis method in interpolation with the Binary Logit Model

Research Outcomes

The results of the data analysis from the questionnaire were divided into 2 groups: 1. The results of the data analysis from the data collection of the non-registered population in Bangkok who chose to rent condominiums. 2. The results of the data analysis from the data collection sample of condominium buyers who used to be the former non-registered population, and the sample of the condominium tenants who were the non-registered population living in the Bangkok area

Results of Data Analysis of Non-Registered Population Samples

The results of the data analysis from the SP method, the simulation situation under the constraints on the size of the usable area that determines the option to buy a condominium unit

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of 1 room with a usable area of 29 square meters, with a total of 3 options are as follows: 1. Choosing to buy a residence along the sky train line. 2. Buying a place outside the sky train line and 3. Not buying a place to stay. The results of the study can be written to show the probability of choosing a residence for the non-registered population in Bangkok as shown in Figure 2.

FIGURE 2
SHOWS THE PROBABILITY OF MAKING A DECISION TO BUY A DWELLING OF THE NON-REGISTERED POPULATION UNDER THE CONSTRAINTS OF LIVING SPACE SIZE

Source: from the calculation

The study found that 56% of the non-registered population were deciding not to buy a place to live in a simulated scenario, and 44% of a simulated housing decision group, in which the sample who made the decision to buy a condominiums, would choose to make the purchase. 28% of the respondents who bought condominiums along the mass transit lines lines had the ability to afford housing that is equal to 15%, and the 13% of the respondents who chose to purchase a condominiums along the mass transit lines were the ones who did not have the ability to buy a home that were based on the home-buying ability criteria on the respondents' monthly income. Another 16 % of the respondents were the group who decided to buy a condominiums to live outside the mass transit lines. The sample group who chose to buy a condominiums along the mass transit lines had the ability to buy a condominiums equal to 7%, and the sample group who bought a residence along the mass transit lines had the ability to buy a residence at 9% was not able to buy a condominiums to live.

Research Model

Buy a condominium = f(price_condo, time_travel, exp_travel, income)

where 'Buy a condominium' is an option to buy a residence with 3 options

price_condo	is the price of a condominium type of residence (hundred thousand baht)
time_travel	is the travel time (minutes)
exp_travel	is the travel expenses (baht)
income	is monthly income (thousands of baht)

Table 1
SHOWS THE RESULTS OF THE ANALYSIS IN THE SIMULATION UNDER THE CONSTRAINTS ON THE SIZE OF THE USABLE AREA. CONDOMINIUM TYPE

Number of obs 200					Log likelihood = -2,349.6514				
choice_1_Near****					choice_2_Far****				
Variable	dy/dx	Std. Err.	z	P>|z|	Variable	dy/dx	Std. Err.	z	P>|z|
price_condo	0.0090	0.0010	8.84	0.000***	price_condo	-0.0075	0.0009	-8.90	0.000***
time_travel	-0.0100	0.0004	-23.82	0.000***	time_travel	0.0016	0.0002	8.43	0.000***
exp_travel	-0.0040	0.0005	-8.26	0.000***	exp_travel	0.0042	0.0005	8.33	0.000***
income	0.0032	0.0008	4.08	0.000***	income	-0.0017	0.0004	-4.53	0.000***

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Source: from the calculation
Note: The estimation result is a comparison with option 3 (not choosing to buy a residence).
*** means statistically significant at 0.01
** means statistically significant at 0.05
* means statistically significant at 0.10

From Table 1, it was found that the factors influencing the decision to choose a residence along the mass transit lines at a statistically significant level of 0.01 include condominium prices have a 0.90 percent increase in chance of deciding to buy, and the monthly income having a 0.32 percent has a chance of purchasing. Travel time has a 1.00 percent lower chance of purchasing decisions and travel expenses have a 0.40 percent chance of purchasing decisions,

It found that factors that influenced the decision to choose a condominium outside the mass transit lines was at a statistically significant level of 0.01, including price_condo and income negatively influenced the probability of deciding to buy a condominium along the mass transit lines, while time_travel and exp_travel positively influenced the probability of deciding to buy condominiums along the mass transit lines.

Analysis of data from the method (SP) scenario under budgetary constraint conditions for purchasing a residence that determines the option to purchase a condominium-type residence at a price of 3,000,000 baht per room with 3 options as follows: 1. Choosing to buy a residence along the sky train line. 2. Buying a place outside the sky train line and 3. Not buying a place to stay. The results of the study can be written to show the probability of choosing a residence for the non-registered population in Bangkok as shown in Figure 3.

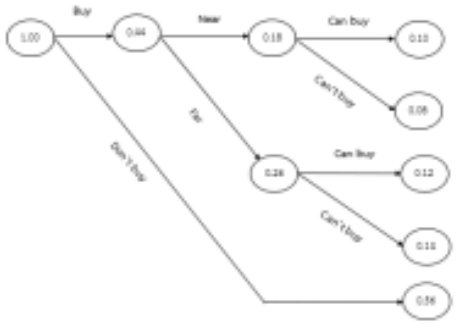

FIGURE 3
SHOWS THE PROBABILITIES OF PURCHASING DECISIONS OF THE NON-REGISTERED POPULATION UNDER BUDGET CONSTRAINTS
Source: from the calculation

The results showed that 56% of the non-registered population were deciding not to buy a condominium to live in a simulated scenario, and 44% were a simulated housing decision group, in which the sample who decided to buy would choose a condominium to live. Purchasing housing along the mass transit lines was 18 % , with the sample group purchasing housing along the mass transit lines with the ability to purchase housing equal to 10%, using the home-buying ability criteria based on their monthly income. Of the respondents and the sample group who choose to buy accommodation along the mass transit lines, another 8 % are incapable of purchasing housing, while another 26% of the sample group decides to buy a condominiums to stay outside the mass transit line. The sample who chose to buy a residence along the mass transit line had the ability to buy a residence equal to 12%, and the sample who purchased a residence along the mass transit line was 14% who did not have the ability to buy a condominiums to live.

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Research Model

Buy a condominium = f(room_size, dist_mall, fitness_pool, bedroom)

by Buy a condominium is the 3 options for purchasing a residence.
room_size is the size of the residential area (square meters)
dist_mall is the distance from the mall (km)
fitness_pool is a fitness facility and a swimming pool (have = 1)
bedroom is the number of bedrooms (rooms)

Table 2
SHOWS THE RESULTS OF THE ANALYSIS IN THE SCENARIO UNDER BUDGET CONSTRAINTS IN BUYING A CONDOMINIUM TYPE OF RESIDENCE

Number of obs 200					Log likelihood = -2,389.0785				
choice_1_Near****					choice_2_Far****				
Variable	**dy/dx**	**Std. Err.**	**z**	**P>|z|**	**Variable**	**dy/dx**	**Std. Err.**	**z**	**P>|z|**
room_size	0.0012	0.0006	2.24	0.025**	room_size	0.0037	0.0012	3.08	0.002***
dist_mall	-0.0787	0.0080	-9.80	0.000***	dist_mall	0.0893	0.0055	16.18	0.000***
fitness_pool	-0.0057	0.0060	-1.04	0.298	fitness_pool	0.0137	0.0149	0.92	0.355
bedroom	0.0124	0.0056	2.19	0.028**	bedroom	0.0239	0.0140	1.71	0.087*

Source: from the calculation

Note: The estimation result is a comparison with option 3 (not choosing to buy a residence).

*** Means statistically significant at 0.01

** means statistically significant at 0.05

* means statistically significant at 0.10

From Table 2, it was found that the factors influencing the decision to choose a residence along the mass transit lines at a statistically significant level of 0.01. Distance from the department store has a probability of 7.87 percent lower chance of purchasing decision; statistically significant level of 0.05 include residential area size, probability on the chance of buying decision increased by 0.12 percent, and with the number of bedrooms, the probability of deciding to buy increased by 1.24 percent.

It was found that factors which influenced the decision to choose a residence the mass transit lines at a statistically significant level of 0.01, including room_size and dist_mall have positively influenced the probability of deciding to buy condominiums along the mass transit lines, while factors with a statistically significant level of 0.10 were bedroom have positively influenced the probability of deciding to buy a condominium along the mass transit lines.

The Results of the Data Analysis of the Samples that Used to be Former Non-Registered Population and Non-Registered Population Samples

The analysis of data from the Revealed Preference Method (RP) surveyed the decision-making data of the residential purchase of a sample that used to be a former non-registered population and the choice of rented a residential unit of a non-registered population sample of condominium types in Bangkok area with the following models used in the research:

Buy a condominium = f(female, age, married, edu, occup, inc, hh_inc, cars, hh_members, freq_bts, exp_bts, freq_taxi, exp_taxi, freq_cars, exp_cars, time_bts, time_taxi, time_cars, house_size, price_sqm, no_pool, dist_mall, exp_condo)

Let Buy a condominium is choice(name=1), female is gender(female=1), age is age, married is status, edu is education level, occup is occupation, inc is monthly income, hh_inc is Total household income, cars is the number of cars, hh_menbers is the number of household members, freq_bts is the number of times sky trains are used per month, exp_bts is the monthly cost of sky trains, freq_taxi is the number of private hire cars per month, exp_taxi is the cost of

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using a private hire car per month, freq_cars is the number of times a private car is used per month, exp_cars is the cost of using a private car per month, time_bts is the amount of travel time by sky trains to work per time, time_taxi is travel time by private car hire to work per time, time_cars is time taken by private car to work per time, house_size is residential size, price_sqm is housing price per square meter, no_pool is swimming pool, dist_mall is distance from residence to shopping mall, exp_condo is common cost per square meter

Table 3
SHOWS THE RESULTS OF THE ANALYSIS OF THE POPULATION SAMPLE IN PURCHASING CONDOMINIUMS

Number of obs 400		**Log likelihood = -236.8843**		
Variable	**dy/dx**	**standard error**	**z**	**P>|z|**
female	-0.0966	0.0474	-2.04	0.041**
age	0.0033	0.0036	0.91	0.361
status				
married	-0.1335	0.0856	-1.56	0.119
divorced	0.0352	0.1537	0.23	0.819
widow	-0.0368	0.1776	-0.21	0.836
edu				
Bachelor's degree	0.2443	0.0768	3.19	0.001***
Postgraduate	0.3184	0.1085	2.93	0.003***
occup				
Employees of a public limited company	-0.0708	0.0906	-0.78	0.435
Doing a private business	-0.0763	0.1048	-0.73	0.467
State enterprise employee	0.0643	0.1169	0.55	0.582
Limited company employee	-0.1779	0.0848	-2.10	0.036**
Other	-0.2966	0.1214	-2.44	0.015**
inc	0.0327	0.0143	2.30	0.022**
hh_inc	-0.0080	0.0052	-1.52	0.128
cars	-0.0086	0.0500	-0.17	0.863
hh_menbers	0.0722	0.0425	1.70	0.089*
freq_bts	-0.0051	0.0057	-0.91	0.364
exp_bts	0.0070	0.0057	1.22	0.221
freq_taxi	-0.0183	0.0087	-2.09	0.036**
exp_taxi	0.0086	0.0044	1.95	0.051*
freq_cars	-0.0040	0.0036	-1.10	0.272
exp_cars	0.0001	0.0016	0.00	0.996
time_bts	-0.0002	0.0018	-0.09	0.929
time_taxi	-0.0014	0.0015	-0.94	0.347
time_cars	0.0034	0.0012	2.72	0.007***
house_size	0.0043	0.0026	1.67	0.095*
price_sqm	-0.0182	0.0106	-1.72	0.085*
no_pool	-0.1409	0.1060	-1.33	0.184
dist_mall	0.0228	0.0134	1.70	0.090*
exp_condo	0.0030	0.0031	0.94	0.345
Prob > chi2 = **0.000**1		AIC : **1.**354	Count R2 : **0.**665	

Source: from the calculation

Note: *** means statistically significant at 0.01
** means statistically significant at 0.05
* means statistically significant at 0.10

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From Table 3, factors with a statistically significant level of 0.01 include individuals with undergraduate and postgraduate degrees, the probability of deciding to buy increased by 31.84 percent and 24.43 percent, respectively, and the duration of travel by private car to work, the probability of deciding to buy increased by 0.34 percent.

Factors with a statistically significant level of 0.05 include females, the probability of deciding to buy decrease by 9.66 percent, individuals working limited and general hire companies, the probability of having a 17.79 percent decrease in purchasing decisions, respectively, monthly income the probability of having a 3.27 percent chance of purchasing decisions increased, and the number of personal hire car uses, the probability of deciding to buy decrease by 1.83 percent,

Factors with statistically significant level of 0.10 percent, including the number of household members the probability of deciding to buy increase by 0.80 percent. the cost of personal hire car, the probability of making a purchase decision increased by 0.86 percent, the size of the residence, the probability of making a purchase decision increased by 0.43 percent, the housing price per square meter, the probability of a purchase decision decreased by 1.82 percent, and from the residence to the mall, the probability of making a purchase decision increased by a percentage point of 2.28.

DISCUSSION AND CONCLUSION

The results of this research study were divided into 2 parts: 1. The study of factors influencing the decision to purchase condominiums by the SP, and 2. The study of factors influencing the decision to purchase and rent condominiums in the type of condominiums by RP method, which can be discussed and summarized as follows:

The results on the study of factors influencing the decision to purchase condominiums in the non-registered population in Bangkok by Stated Preference (SP) method in a simulated situation under the constraints on the size of living space determined that there is an option to buy a residence A condominium type of 1 room with a usable area of 29 square meters, in which the scenario will study the behaviors related to decision-making in the area of personal spending. It was found that the non-registered population would choose a place to stay near a BTS station over a residence that is far away from a BTS station because of the convenience and less time being spent when traveling by car. The data collection from the questionnaire illustrated that traveling by train can be calculated more accurately in travel time than traveling by car, which is consistent with the research by Jia Guo (2020). The estimation results show that condominium housing price factor affects the probability of purchasing a condominium which is in line with the research done by Jae Hong Kim (2005). Monthly income has an impact on the probability of making a decision to buy a condominium, which is consistent with the research from Patricio E. Pe´rez (2003). Travel time affects the probability of making a decision to buy a condominium, which is consistent with the research by Chaug-Ing (2006), and from Jonas De Vos (2016). The accommodation near the train station is in line with the income of the individual, indicating that if a person has enough income to buy a condominium near a train station, the person is more likely to buy a condominium near the station. The individual condominium takes into account the length of commuting time to work and the cost of travel as travel time is the opportunity cost of the time that the person will use for other uses and expenses. Traveling is a cost that a person has to pay on a daily basis. If a person chooses to buy a condominium near a train station, then the opportunity cost of travel time is reduced and the cost of commuting is reduced. The cost of buying a condominium near a train station (Ismir, 2020) is chosen because a condominium that is near the train station is more expensive than a condominium that is far away from the train station.

Scenario under budget constraints for buying housing that determines the option to buy condominium-type residences at a price of 3,000,000 baht per room. In such situations, behaviors related to decision-making in terms of comfort of living will be studied according to

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changes in housing size and facilities factors. By setting a fixed budget for condominium purchases, it is found that the non-registered population will Decide to buy a residence that is far from a BTS station rather than a residence near a BTS station because condominiums far from a BTS station will have a larger room space than condominiums near a BTS station. Skytrains are also cheaper than condominiums near BTS stations and have larger interior spaces, in line with research by (Jia) Guo, 2020). The model estimation results show that the condominium residential area size factor affects the probability of making a decision to buy a condominium (Jia Guo, 2020). The estimation results from the model show that the condominium residential area size factor affects the probability of making a decision to buy a condominium (Jia Guo, 2020). Distance from the mall affects the probability of deciding to buy a residence, the number of bedrooms affects the probability of deciding to buy a residence, in accordance with the research of (Carola de Groot,2011), which found that the non-registered population is more likely on deciding to buy a condominium according to the direction with the increase in size of the living space, thus indicating that under a limited budget the person is willing to choose a condominium with more living space instead of condominiums near the Skytrain station (Amy,2017). Since condominiums with a lot of living space will be able to do more activities in a person's leisure in exchange for travel convenience and travel time savings, it is also evident that the person who decides to buy a condominium near the Skytrain station will not prefer to choose a place near the mall, since condominiums near the BTS station are conveniently located, so there is no need to take into account walking to the mall (Vincent,2013).

Results of the study of factors influencing the decision to buy and rent condominium housing by means Reveled Preference (RP) revealed that there is a group deciding to buy condominiums and groups deciding to rent condominiums who are non-registered populations based on estimation models, with personal factors finding that females, undergraduate and postgraduate degrees, careers, limited and self-employed employees, monthly income and number of household members affect the probability of deciding to buy a condominium (Jonas De Vos,2020) , (Carola de Groot,2011), (Jia Guo,2019), (Gusti Ayu Andani,2020). As for behavioral factors in choosing a residence, it was found that the frequency of use of a private hire car and the cost of using a private hire car influenced the probability of deciding to buy a condominium in line with the research (Patricio,2003). The length of travel by private car to work affects the probability of deciding to buy a condominium (Chaug-Ing,2006). The size of the residence affects the probability of deciding to buy a condominium (Jae Hong Kim,2005). Residential prices affect the probability of deciding to buy a condominium (Jia Guo,2019). The distance from residence to shopping mall affects the probability of deciding to buy a condominium (Jia Guo,2019). The work found that female individuals are less likely to make condominium decisions than males because male individuals have a greater need for freedom of residence than females, resulting in men deciding to work farther from their homeland than women, and another reason families in Thai society are more concerned about women than men (Misa,2014). The level of education will affect a person's job duties and income, where higher income will affect the power to make more condominium decisions, since in commercial bank lending, income and job security are taken into account. Individuals working in limited companies do not have much income and welfare, as well as a small career security, which directly affects the decision to buy condominiums, as buying condominiums are less iquidity property that takes quite a long time to change hands. In addition, in applying for loans from commercial banks, the company's income and stability are considered which makes it less likely that individuals working in limited companies will pass through the loan. Self-employed individuals will be with uncertain incomes and clear sources of income, resulting in self-employed individuals not qualifying for loans from the commercial banks by most self-employed individuals who will buy condominiums with cash. Monthly income shows the power to purchase condominiums and regarded as the main factor in purchasing decisions, because the income will be both a factor in which a person will estimate their purchasing

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potential, and the bank also takes income into account as an important factor in the approval of loans. The number of uses of private hire cars tends to decrease when a person decides to buy a condominium, since the person who decides to buy a condominium in the area near the premises and the workplace can travel by using the public transportation system instead because the costs are a lot cheaper than using one's car to get around town (Zhou,2013). The cost of a private valet is likely to increase as most individuals who decide to buy condominiums apply for loans from commercial banks to buy condominiums. As a result, the person will have to pay off their monthly debt with the bank, whose debt obligations will cause the person in not choosing to buy a private car as it helps to reduce the monthly cost of installments and maintenance of owning a private car (Caroline,2020). The size of the living space will have a direct effect on the decision, since the general public has a need for a large living space, which will be more convenient for various activities in the room than a small living space. Condominium prices will be an important factor in purchasing decisions because individuals will have a limited income or budget to purchase condominiums. Individuals will most likely choose the residential location that they want first, and then the next factor would be on the consideration of price. The distance from the place of residence to shopping mall is likely to be with a person deciding to buy a condominium that is near the mall, because this individual will need to have a closer access to go shopping, make some financial transaction, or spend some leisurely free time at the mall.

From the analysis of the study results, it was found that the study by Stated Preference (SP) and the study by Revealed Preference (RP) were consistent in the study of factors influencing the decision to purchase condominiums. In the simulation scenario under the constraints on the size of living space, it was found that the factors of accommodation price, travel time, travel expenses and income were consistent with the results of the study. In terms of budget constraints, it was found that the size of the area, distance from shopping malls and swimming pools had consistent results. Therefore, the study of Stated Preference (SP) and Revealed Preference (RP) method provided consistent results.

Research Implications

From this research, it was found that most people would choose accommodation that can be traveled by train because of the convenience and speed of transportation. Therefore, the government should promote the construction and expansion of sky train routes in the Bangkok area. The government sector should extend the sky train line to the suburbs for the expansion of residence to the suburbs or nearby provinces for the purpose of reducing the population density in the inner Bangkok area through the expansion of the sky train route. Also, the government should encourage individuals to have greater access to condominium ownership as condominium prices in suburban areas are lower than condominiums in urban areas, which will result in better quality of life for non-registered population in Bangkok in terms of housing. Owning and having a home in a convenient area and getting access to fast commuting for the purpose of working in the inner city will lead to a better quality of life. In addition, in the real estate development sector, the study results can be used as a development guideline for a condominium project. The study indicates that non-registered populations in Bangkok are interested in purchasing condominiums along the mass transit lines under their ability in making a reasonable financial purchase. As for the factor of residence size and location near the shopping malls, it is important in attracting the non-registered population in Bangkok towards deciding to buy condominiums outside the mass transit lines.

Future Research

For the next research, there will be a study on the population of Bangkok residents who decide to rent condominiums and on the population of Bangkok residents who decide to buy

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condominiums in Bangkok, which should be added to compare the results of the study of the non-registered population who rent condominiums and those that used to be categorized as the non-registered population in Bangkok. In addition, studies should be added to the study of condominium real estate developers of the country's leading major operators and condominium real estate developers of major operators. The next study should be on the factors influencing the differences in corporate image and the credibility of the project developers in deciding to buy condominiums next.

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