

COMMUTER HOUSING ARRANGEMENT IN BEJI SUB-DISTRICT, DEPOK CITY, WEST JAVA

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ABSTRACT

Greater Jakarta has a high sprawling urban area for the whole city. Beji Sub-district in Depok is the home of Jakarta's commuters. With the high density of the residential area with various housing types, commuters who stay in this area have many living options. Respondents in this study are commuters who work in the DKI Jakarta area and stay in Beji Sub-district, Depok City. The research questions of this study focus on how the relationship between accessibility factors and the variation of housing chosen by commuters in Beji District, Depok City, and how the factors of a residential area, number of dwelling members, and social facilities influence the decision of commuters to live in housing in Beji District, Depok City. The objective of this study is to determine the factor that had influenced commuters' housing choices. With chi-square analysis, the accessibility level had a significant relationship with the type of housing arrangement; most commuters live in the landed house in residential areas with easier access. According to the multinomial logistic regression model, the most influential factor was the number of dwelling members. Commuters living in a rented house with 1 – 2 members are twice as likely to live in a boarding house. Commuters living in apartments 3,8 times chose near education facilities than commuters living in a boarding house. Lastly, commuters living in the landed house were not influenced by any variable in this study.

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INTRODUCTION

The phenomenon of the megapolitan area that occurs in the Jabodetabek area is a phenomenon that occurs by forming an integrated spatial concept so that it can create equitable population welfare and a balanced rate of development for people in Jakarta area and its surroundings (Rusli et al., 2009). The increase in population that occurred in the Jakarta area was caused by the capital city of Indonesia, which became the centre of the economy with adequate infrastructure conditions, but the government was unable to accommodate population growth.

The megapolitan area formed in the Greater Jakarta area is caused by the cities around the Jakarta area having a role as a buffer zone that continues to develop. The development of cities around Jakarta is supported by factors related to community needs related to vacant land and causes the number of vacant lands to decrease in line with the increase in built-up land in the Jakarta area. The area of available vacant land is decreasing so that it requires a buffer area for Jakarta, namely the surrounding cities consisting of Bogor, Tangerang, and Bekasi since 1976. The city of Depok has joined as a buffer zone since 1999, with its role specifically to provide residential areas and various necessities of life for Jakarta commuters.

According to the 2019 Commuter Survey Results, commuters who carry out commuting activities to the Jakarta area, with a percentage of 11,45 percent or equal to 2,157,203 million people come from the Bodetabek area (Central Bureau of Statistics, 2019). In the Jabodetabek area, public transportation, specifically the commuter line train is often used by the community to facilitate commuting activities (Syifa, 2014). The availability of train routes becomes a factor of consideration for residents living in the Greater Jakarta areas as it becomes a means of comfortable transportation for shuttling back and forth to work.

Rustiadi and Panuju (1999) said that the migration of urbanites or residents of Jakarta to the outskirts of Jakarta, in other words, the Bodetabek

area, is caused by the price of residential land being relatively more affordable when compared to the price of residential land in the Jakarta area (Syifa, 2014). The factor that drives the increase in demand and land prices is the increasing number of commuters with the desire to choose strategic housing located around transportation routes (Agus, 2006). According to Bürgele (2006), commuters consider the size of the unit or the area of the selected dwelling according to the number of dwelling members (Patrick et al., 2014). The more the number of dwelling members, the more space zones are needed in a dwelling.

The choice of Depok City as a residential area for residents who do commuting is because of its strategic location, which is close to the DKI Jakarta Province and other cities such as Bogor, Tangerang, and Bekasi, which have merged into an area commonly known as Jabodetabek (Chotib, 2019). The increase in the number of residential areas is one of the causes of the decline in vacant/unbuilt lands in Depok City. In 2005, Depok City utilized 44.31 percent of the space for residential areas and 50.23 percent of green open space from the area of Depok City based on data analysis of the 2000-2010 Revision of the Depok City RTRW.

The pressure of community needs related to the use of land for settlement activities causes an increase in built-up land to reduce the physical condition of Depok City. Depok City is the choice of residence for people who work in the Jakarta area because it has ± 40 km to the south from the centre of Jakarta. Depok City is one of the buffer zones for Jakarta by providing settlement facilities, water absorption, and educational facilities (Asep, 2020). Beji Sub-District is one of eleven sub-districts in Depok City that has many housing variations. The housing variations in Beji Sub-District are family houses, apartments, boarding houses, and rented houses. Based on this background, the objective of this study is to determine the factor that had influenced commuters' housing choices in Beji Sub-District, Depok City.

THEORETICAL REVIEW

Housing Variation

Housing variations are divided into two categories, be specific, owned housing and rental housing. Owned housing is divided into four types: buying houses, parents' houses, relatives' houses, and apartments (Imega et al., 2019). According to Nurdini (2009), there are four types of rental housing, namely houses, pavilions, boarding houses, and apartments (Bunga et al., 2016). Meanwhile, according to Bunga et al. (2014), there are four types of rental housing variations, including boarding houses, rented houses, dormitories, and apartments.

A landed house is a residence owned by the occupants of the house and the family members concerned who live in the house (Imega, 2019). According to Utomo (2009), boarding houses are rooms that are rented out for a certain period as temporary residences (Ghifari, 2017). Apartments are medium and high-rise residential buildings consisting of residential units with more complete facilities than other housing types. Apartments prioritize comfortable and safe environmental conditions with residential arranged vertically and horizontally (M. Furqan, 2013). Rent is a rental house for the community within a certain period following the price and rental agreement between the two parties (Pramudi, 2009).

Factors for Choosing Housing Variations

Community selection related to housing plays an important role in land use and transportation policies so that community needs can be met in both physical and social aspects (Gobi et al., 2014). According to Renkow and Hoover, population growth in suburban areas is caused by workers who prefer to spend more time commuting to work but receive lower housing prices. Bürgle (2006) said that the commuters consider the size of the unit or the area of the selected dwelling according to the number of dwelling members (Patrick et al., 2014). Axhausen (2004) also included the statement about having a number of dwelling members, the more zones of space are needed in a dwelling.

Drabkin's theory explained that the residential selection factors by the community are caused by accessibility factors that are affordable using transportation between residential locations and workplaces, physical and social environmental conditions, the level of public services available with facilities and infrastructure (Erlana et al., 2017). According to Varvoglis and Sirgy (1984), functional suitability in the selection of housing is used as a psychological evaluation based on comparing the aspect of the dwelling with the desired ideal factor (M. Joseph et al., 2005). The factor that drives the increase in demand and land prices is the increasing number of commuters with the desire to choose strategic housing located around transportation routes (Agus, 2006).

Based on the aspect of distance between the station and the city road with the residential residents of commuters, accessibility in this study is divided into two categories, specifically easy and challenging. These categories are based on measuring respondent's addresses from questionnaire data. The residential area in this study is divided into categories of small residential and large residential areas. The categorization of residential area is based on the General Guidelines for Healthy Simple Homes according to the Decree of the Minister of Settlement and Regional Infrastructure 403/KPTS/M/2002 which explains that the room that must be available in each dwelling consists of one bedroom, one bathroom, and one multipurpose room with a land area of 60 m². The number of residential members in this study is divided into three classifications, specifically the number of residential members as many as 1-2 people, 3-4 people, and 5 people. Social facilities in this study are the availability of affordable educational facilities and health facilities, namely housing residents within a radius of 400 meters.

Methods

This research was conducted in Beji Sub-District, Depok City, West Java. The unit of analysis in this study is a commuter who works in the DKI Jakarta area and decided to live in the Beji Sub-district. The variables used in this study are the variation of commuter's housing type as the dependent variable and accessibility level, the dwelling number, number of education facilities, and number of health facilities as independent variables. The variations of housing used in this study are a landed house, a boarding house, an apartment, and a rented house.

This study uses primary and secondary data for the data processing stage. Secondary data needed are Depok City administrative boundaries, road network shapefile, and Depok City RTRW data obtained from the Depok City Public Works and Spatial Planning Service. On the other hand, the primary data needed in this study is the variation of housing, accessibility, the number of dwelling members, residential area, and social facilities obtained based on questionnaires, digitization, and observation. The sample collection method used in this study is random sampling with a quantitative method approach. The incidental sampling technique does not specify the sampling method but collects data based on the sampling results found (Sugiyono, 2015).

The population criteria used as samples in this study are commuters who work in the DKI Jakarta area and stay in Beji Sub-district, Depok City. Respondents in this study were obtained by filling out a google form questionnaire collected for five weeks and got 91 respondents. The overall data from the Google Form questionnaire that is entered will later go through the data cleaning stage. The data cleaning process was done based on the objectives sampling criteria from all incoming data from the results of the google form questionnaire so that the data obtained is valid for further data processing. After doing the data cleaning process, the sample quantity is 81 respondents.

The distance data was generated with proximity and cluster analysis in ArcGIS 10.3 software from each housing point to the sub-districts closest main road and two main train stations. The result generated from distance data was categorized as a level of accessibility—Table 1 shows the process.

Table 1. Accessibility Factor Category Matrix (meters)

Distance from Residential to City Street	Distance from Residence to Pondok Cina Station		
	≤1000	1001-2000	>2000
≤1000	Easy	Easy	Difficult
1001-2000	Easy	Easy	Difficult
>2000	Easy	Easy	Difficult
	≤1000	1001-2000	>2000
	Distance from Residence to Universitas Indonesia Station		

Source: Data Processing, (2021)

The type of data analysis used in this study was spatial analysis, chi-square analysis, and multinomial logistic regression analysis. Spatial analysis was carried out based on the distance between each commuter house to the main roads and train stations due to their commuting transportation channel. The social facilities variable will explain the availability of educational and health facilities within a 400-meter radius from their house—the walkable distance.

The chi-square analysis in this study was to determine the relationship between each independent variable and dependent variable. Logistic regression analysis was used to predict and explain what might affect the probability of commuter housing arrangement. Multinomial logistic was used because it is more than two categories (Jon et al., 2011). The operational variables are explained in Table 2.

Table 2. Variable Operational Definition

Variable	Code	Category	Operational Definition
(Dependent Variable) Housing Variations	FH BH AP RH	Landed House = 1 Boarding House = 2 Apartment = 3 Rented House = 4	Y= 1; Landed House 0= Other Y= 2; Apartment 0= Other Y= 3; Rented House 0= Other Comparison = Boarding House
Residential Area	RA	Small = 1 Large = 2	RA= 1; Small, 0= Other Comparison = Large
Number of Residential Members	NRM	1 – 2 members = 1 3 – 4 members = 2 ≥5 members = 3	NRM = 1; 1 – 2 members 0= Other NRM = 2; ≥5 members 0= Other Comparison = 3 – 4 members
Education Facility	EF	Affordable = 1 Unreachable = 2	EF = 1; Affordable, 0= Other Comparison = Unreachable
Medical Facility	MF	Affordable = 1 Unreachable = 2	MF = 1; Affordable, 0= Other Comparison = Unreachable

Source: Data Processing, (2021)

The multinomial logit model used in this study consists of 4 categories based on Dr. Jon S. & Dr. Amanda K. M. (2011), so the first, the second, and the third multinomial logistic regression models are obtained with the formula:

$$\ln \left(\frac{P_{y1}}{n} \right) = b_{10} + b_{11}RA + b_{12}NRM1 + b_{13}NRM2 + b_{14}EF + b_{15}MF(1)$$

$$\ln \left(\frac{P_{y1}}{P_{y0}} \right) = b_{20} + b_{21}RA + b_{22}NRM1 + b_{23}NRM2 + b_{24}EF + b_{25}MF(2)$$

$$\ln \left(\frac{P_{y1}}{P_{y0}} \right) = b_{30} + b_{31}RA + b_{32}NRM1 + b_{33}NRM2 + b_{34}EF + b_{35}MF(3)$$

The next stage is to test the hypothesis in the form of a partial test

(wald test) by testing the parameters. The partial hypothesis test is useful for testing the effect of each regression coefficient parameter () to determine the effect of the independent variables in the model. The decision of the statistical test is to reject H0 if $p - \text{value} < \alpha$.

RESULT AND DISCUSSION

Housing Variations of Commuters Based on Accessibility Factors

Residents of commuters spread close to the various types of accessibility available, especially train stations and city roads. The train stations located in Beji Sub-district are Pondok Cina Station and the University of Indonesia Station. Meanwhile, the city road in Beji Sub-district consists of KH. M. Usman Street, Nusantara Raya Street, Ir. H. Juanda Street, Tanah Baru Street, and Margonda Raya Street. The variety of affordable housing by the accessibility of the train station and city roads can be determined based on the metric distance travelled by commuters in Beji Sub-district.

Accessibility in the easy category is measured by commuter residences with 2 – 3 choices of access to city roads and train stations in Beji Sub-district in 2000 meters of distance. Meanwhile, accessibility in the difficult category is the accessibility between commuter residences with 2 – 3 choices of access to trains and city roads in Beji Sub-district which has a distance of >2000 meters. The following is a crosstab table of accessibility taken by commuters to accessibility in the Beji Sub-district.

Table 3. Accessibility of Commuters to Housing Variations

Housing Variations	Accessibility		Total
	Easy	Difficult	
Landed House	61%	39%	100%
Boarding House	100%	-	100%
Apartment	67%	33%	100%
Rented House	67%	33%	100%
Total	68%	32%	100%

Source: Data Processing, (2021)

Overall, the housing of commuters is dominated by easy accessibility conditions from the total respondents of commuters in the Beji Sub-district. The variety of housing where commuters live has easy accessibility because every area in Beji Sub-district has various types of accessibility, both city roads and train stations. Depok City government has developed a central system for serving city activities to all sub-districts in Beji Sub-district. The land transportation network system, including the city road network and stations have been developed, making it easier for commuters living in housing areas in Beji Sub-district to commute to their work destination areas in DKI Jakarta. The relationship between accessibility factors and variations in the housing of commuters in Beji Sub-district can be determined by using a chi-square correlation analysis. The accessibility factor is carried out by the chi-square test, which is useful for knowing the suitability test results or the correlation between research data and the distribution model and knowing the results of the distribution model test based on research data. The data processing of the chi-square test results is presented in a table containing the chi-square value and the significance value (p-value). Based on the chi-square calculation, the correlation test results obtained are based on SPSS calculations between the accessibility factors for the four categories of housing variations.

The correlation test results obtained are the accessibility factor with a p-value of $0.000 < 0.05$, so it can be concluded that the accessibility factor has a significant and significant correlation/relationship with the selection of commuting housing variations. Commuters consider the accessibility factor when choosing a house in Beji Sub-district. Accessibility to the city roads and train stations is an important factor related to commuting activities for commuters in Beji Sub-district. This is because the movement of every individual working in the DKI Jakarta area requires adequate accessibility to facilitate travel to the work destination.

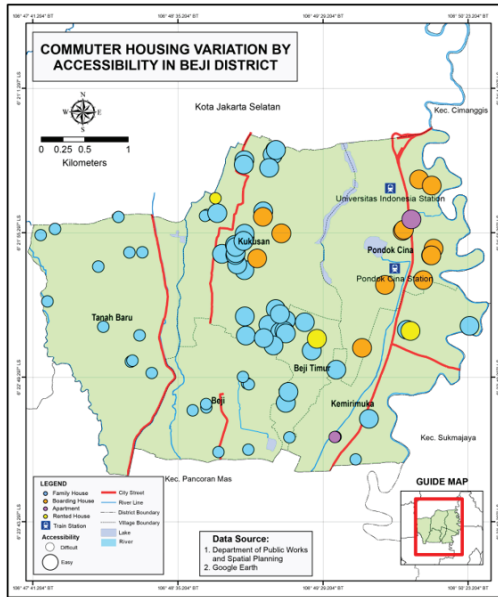


Figure 1. Housing Map of Commuter According to Accessibility in Beji Sub-District

Source: Data Processing, (2021)

The variations of commuter housing that have easy accessibility are all boarding houses which are located close to the station and city roads. The housing variation is 1000 meters from Margonda Raya Street, Pondok Cina Station, and the University of Indonesia Station. The variety of boarding houses located in areas with easy and strategic accessibility conditions to the location of Pondok Cina Station, University of Indonesia Station, and city roads in Beji Sub-district is the main factor that causes migrants from outside Beji Sub-district to decide to live in boarding houses. In Beji Sub-district, commuters who choose to live in boarding houses consider the access available around their housing environment to enable their daily commuting activities.

Meanwhile, commuters' residences with difficult accessibility conditions are dominated by a portion of landed houses scattered in Beji Village and Tanah Baru Village. The dominant of landed house is 1000 meters from the city road but >2000 meters from Pondok Cina Station and Universitas Indonesia Station. This is due to the location of Pondok

Cina Station and the University of Indonesia Station, which are located in Pondok Cina Village so the distance between the train station and housing areas outside the Pondok Cina Village is relatively far.

The Influence of Factors on Choice of Housing Variations of Commuters in Beji Sub-district

The influence of these factors on the choice of housing variation of commuters in the Beji sub-district is known based on multinomial logistic regression analysis. It is known that pseudo-r-square or coefficient of determination (R²) at the Nagelkerke value of 0.848. So, it can be described that the dependent variable that the independent variables in this study can explain is 84.8 percent and about 15.2 percent is explained by other independent variables outside the factors in this research model.

Table 4. Likelihood Ratio Tests of Logistic Regression

Variable	Chi-Square	df	Sig.
Constant	0,000	0	.
Residential Area	28,518	3	0,000*
Number of Residential Member			
1-2 members	11,447	3	0,010*
≥5 members	4,520	3	0,211
Education Facility	0,907	3	0,824
Medical Facility	4,667	3	0,198

Source: Data Processing, (2021)

Decision making is based on the hypothesis if the $p\text{-value} < \alpha = 0.05$, it is known that the $p\text{-value}$ factor of the residential area and the number of residential members is $\alpha < 0.05$, then partially the variable residential area and the number of residential members affect the selection housing by commuters. In the $p\text{-value}$ of the variable education facilities and health facilities obtained a value of $\alpha > 0.05$, then partially the variables of educational facilities and health facilities do not affect the choice of housing by commuters.

Table 5. Estimation Parameters of Landed House on Housing Selection Factors

No	Variable	β	S. E.	Wald	p-value	Exp (β)
1	Constant	32,142	3889,044	0,000	0,993	

2	Residential Area -	- 44,361	3110,422	0,000	0,989	5,423
3	Number of Residential Member					
	1-2 members	28,413	2227,370	0,000	0,990	2,186
	≥5 members	-	3226,625	0,000	0,996	1,554
4	Education Facility	- 10,731	8577,001	0,000	0,999	2,186
5	Medical Facility	13,035	1518,596	0,000	0,993	4,583

Source: Data Processing, (2021)

In the selection model for landed house after the Wald test, no significant factors influence commuters in choosing a landed house. So, it can be concluded that commuters who choose to live in a landed house are not influenced by the factors in this study but are influenced by other factors outside of this study.

$$\ln \left(\frac{P_{y1}}{P_{y0}} \right) = 32,142$$

Table 6. Estimation Parameters of Apartment on Housing Selection Factors

No	Variable	β	S. E.	Wald	p-value	Exp (β)
1	Constant	-2,444	8111,010	0,000	1,000	
2	Residential Area	-0,278	4750,559	0,000	1,000	0,758
3	Number of Residential Member					
	1-2 members	1,609	1,612	0,996	0,318	5,000
	≥5 members	1,112	6574,243	0,000	1,000	3,041
4	Education Facility	-17,072	0,000*	.	0,000	3,853
5	Medical Facility	-16,579	8904,627	0,000	0,999	6,306

Source: Data Processing, (2021)

In the apartment housing selection model after the Wald test, commuters who live in apartments choose housing that is affordable by educational facilities, which is 3.8 times larger than boarding houses. Then it can also be seen that commuters who choose to live in apartment housing prefer to live in housing that is affordable by educational facilities compared to housing that is not covered by educational facilities. So, it can be concluded that commuters who decide to live in apartment housing consider educational facilities.

$$\text{Ln} \left(\frac{P_{y2}}{P_{y0}} \right) = -2,444 - 17,072EF$$

Table 7. Estimation Parameters of Rented House on Housing Selection Factors

No.	Variable	β	S. E.	Wald	p-value	Exp (β)
1	Constant	-7,661	6826,338	0,000	0,999	
2	Residential Area	-42,603	3110,423	0,000	0,989	3,147
3	Number of Residential Member					
	1-2 members	46,711	0,000*	.	0,000	1,934
	≥5 members	2,424	6089,548	0,000	1,000	1,295
4	Education Facility	-28,757	3221,959	.	0,935	3,245
5	Medical Facility	15,417	1518,596	0,000	0,992	4,959

Source: Data Processing, (2021)

Meanwhile, in the model of choosing a rented house after the Wald test, commuters who have 1 – 2 residential members are twice as likely to choose housing in rented accommodation compared to housing in boarding houses. Then it can also be seen that commuters who choose to live in rented housing have residential members as many as 1-2 people compared to the number of residential members who are more than two people. So, it can be concluded that commuters who decide to live in rented housing consider the members of the commuter residences who live alone or in pairs in one dwelling. Then from the housing system, rent is a rental for one dwelling, while boarding houses are rented rooms/housing units only so that the rental housing is by the needs of the commuter residents who live in pairs.

$$\text{Ln} \left(\frac{P_{y3}}{P_{y0}} \right) = -7,661 + 46,711\text{NRM1}$$

Then the categorization of housing variations is carried out with a classification accuracy test that is useful for knowing the percentage value of the accuracy of all the resulting logit models. The following is a table that describes the percentage of accuracy of all logistic regression models.

Table 8. Test of Accuracy of Housing Variation Classification

Observation	Observation				
	Landed House	Boarding House	Apartment	Rented House	Percentage of Accuracy

Landed House	62	0	0	0	100%
Boarding House	1	12	0	0	92,3%
Apartment	1	2	0	0	0,0%
Rented House	2	0	0	1	33,3%
Total Percentage	81,5%	17,3%	0,0%	1,2%	92,6%

Source: Data Processing, (2021)

Based on Table 8, it can be seen that the percentage value of the overall logit model accuracy which is 92.6 percent can be classified correctly and the remaining 7.4 percent is not properly classified. The percentage value of accuracy with a value of more than 50 percent, then the resulting logit model has interpreted the factors of housing selection by commuters in Beji Sub-district.

CONCLUSIONS

The most dominant Jakartan commuter in Beji Sub-district decided to live in a land house in residential areas due to adequate access to commuting activities. The accessibility factor played a significant role in this decision and was shown by the high chi-square score. Beji Sub-district's residential areas placed in Depok City's heart is the most accessible area relative to the rest area in Depok City. Beji Sub-district has been served by main city roads, has a toll gate that connects to the whole greater Jakarta, and has the train station as access for the movement of commuters to Jakarta.

Each variable used in this research has a varied level of significance due to housing arrangement probability. According to the multinomial logistic regression model, the number of dwelling members that explained the commuter decision was the most influential factor in Beji Sub-district. Commuters who live in rented housing with 1-2 members are twice as likely to live in boarding houses. Then commuters who live in apartment housing 3.8 times choose close to educational facilities than commuters in boarding houses. Meanwhile, commuters who live in landed houses are not influenced by any factors in this study.

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AUTHOR CONTRIBUTIONS

All authors contributed to the design of the research, the questionnaire, and the write-up. The on-line survey, data cleaning and tabulation was undertaken by (Department of Geography, Depok, Indonesia). All authors have read and approved the final manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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