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Analysis of the selection of land transportation modes in Serang City

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ABSTRACT

The role of urban transportation is vast in supporting the mobility of city residents because, after all, urban people need city transportation, and most community groups depend on city transportation to meet their mobility needs. Along with the development of the era of online application-based transit, they are becoming newcomers as a service that makes it easier for people to carry out travel mobility, such as online motorcycle taxis. This study aims to determine the mode selection model between city transportation and online motorcycle in Serang City. In this study, the approach used is quantitative and primary data sources obtained from distributing closed questionnaires to 43 city transportation travelers and 57 respondents to online motorcycle drivers. The data analysis used is the difference binomial logit model to determine the probability model of the traveler in choosing the mode. The results of modeling the choice of the way with the difference in binomial logit results in city transportation having the opportunity/probability of being chosen by travelers in Serang City at 45.64% while the probability/chance of selecting an online motorcycle is 54.36%.

Key Words: city transportation; online motorcycle taxis; different binomial logs; mode selection models

INTRODUCTION

Transportation is a movement that facilitates humans carrying out daily activities from one place to another (Tamin, 2008). Transportation also acts as the lifeblood of the nation and state because transportation can be used as a driving force and also a supporter of development (Dodi & Nahdalina, 2019). With the increasing economic activity and development in a region, the need for travel is increasing, for example, in the City of Serang. Acting as the center of government for Banten Province, which is in a central and strategic position, Serang City is also a buffer city for the capital city of Jakarta. Therefore, the City of Serang continues to grow with its significant population, increasing yearly and reaching 688,603 people in 2019 (BPS Province of Banten, 2020). The need for transportation services is also increasing with the increasing population growth.

In carrying out their journey, users of transportation modes can choose several available transportation modes. The choice of this mode of transportation is determined by the type of trip, the characteristics of the traveler, as well as the level of service of the transportation system (Wright, 1989). Opportunities for choosing a mode of transportation are chosen due to several factors, namely the fastest time, the shortest route, and the lowest cost, or even a combination of these three factors (Haradongan, 2014). Other factors that also affect are safety and inconvenience (Zahara & Lubis, 2018). Furthermore, variables that also determine and are considered in choosing the type of transportation mode include the purpose of the trip, costs, distance traveled, and level of comfort (Tamin, 2008). Thus, determining the choice of transportation mode when traveling is an essential classical model in transportation planning (Ortuzar & Willumsen, 1994).

Modes of transportation are urgently needed, especially for areas that continue to grow, and population growth continues to increase, thereby affecting the demand for transportation services in the area (Suyadi et al., 2021), and the city of Serang is no exception. Therefore, to support population mobility, city transportation is operated. City transportation services in the city of Serang are organized using passenger cars served on regular and regular routes. However, in reality, city transport routes in Serang City are irregular, resulting in the fattening of routes and a lack of bus stops for city transportation and causing congestion. Along with the times, online application-based

transportation is becoming a newcomer as a service that makes it easier for people to travel. Online transportation is a phenomenal start for the development of transportation services which is in line with globalization, where financial technology gives rise to online transportation services. The emergence of online transportation in Serang City adds to the choice of travelers in determining the mode used. Therefore, this study aims to determine the mode selection model between city transportation and online motorcycle in Serang City.

Mode Choice Model

Mode choice or mode selection is a stage in determining the travel expenses of people and goods who will use or choose various modes of transportation available to serve a particular point of origin-destination for specific travel purposes (Tumewu, 1997). Modeling is integral to most decision-making processes (Almasri & Alraee, 2013). This modeling is used to explain the effect of changes in behavior and changes in infrastructure improvements (Al-Salih & Esztergár-Kiss, 2021). The mode of transportation is very influential in supporting fast, safe, and integrated traffic movements (Dwiatmoko et al., 2020). In the four-stage travel modeling process, the mode choice model to determine the probability of a traveler using a particular mode of transportation (Kim et al., 2020), and the determination of this mode of transportation is a way to move from the place of origin to the destination (Widyaningsih & Daniel, 2019). Spatial determinants influencing the mode choice include land use structure, the time factor, accessibility to the mode of origin, and the cost of using this mode of transportation (Witchayaphong et al., 2020). While the group of factors that are considered to have the most decisive influence on travel behavior in choosing a mode is travel characteristics, characteristics of the traveler, characteristics of the transportation system, and characteristics of cities & zones (Haradongan, 2014).

Binomial Logit Model of Difference

Ben-Akiva et al. in 1985 explained, logit is part of a class of econometric models based on random utility maximization (Zhao et al., 2020). Mode choice or mode selection modeling can be categorized into classifications, providing an alternative to the logit model (Zhao et al., 2020). This binomial logit model can only be used in determining the probability of selecting two modes of transportation (Miro, 2005). The utility of the transportation mode choice model is presented in equation 1 (1).

$$U_{CT} - U_{OM} = a + b_1 X_1 + \ldots\ldots\ldots + bnX \quad (1)$$

$U_{CT}–U_{OM}$ = utility value of both modes

a = Parameter constant

b_1 until bn = Regression parameters

X_1 until Xn = Variables that influence.

To determine the value of the coefficients and constants, calculations are performed using regression modeling with the SPSS program. After the constants and each coefficient are obtained, the value of the regression coefficient can be known from each independent variable or attribute for all utilities.

RESEARCH METHODS

Research place

The location determined in conducting the research is the City of Serang with City Transportation Route No. 1 destination Pakupatan Terminal – Kebon Jahe and vice versa.

Method of collecting data

In this study, the primary data was obtained by distributing closed questionnaires to 43 respondents who traveled by city transportation mode and 57 who traveled by online motorcycle mode. The data asked in the questionnaire regarding travel costs (X_1), travel time (X_2), and headway (X_3).

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Data analysis

Data from respondents' questionnaire answers were analyzed using SPSS, and then a reliability test and validation test were carried out on the data. The test is carried out to measure the validity of a question item. The next process is to carry out the transformation with the aim of changing the respondents' answers from qualitative data to quantitative data so that further analysis can be carried out. Data changes are made based on a predetermined numerical scale. The numerical scaling is based on the linear equation of the binomial logit model. To ensure the effectiveness of all the attributes that have the same difference in utility together, testing the hypothesis of variation in the utility value of the F-test is carried out by comparing f counts and f tables. As for ensuring whether there is influence or not the independent variable on the dependent variable is tested with the t-test regression model and compares the results with the t table. Then the R square test to determine the significance or essential contribution of the influence exerted by the independent variables together on the dependent variable.

RESULTS AND DISCUSSION

Characteristics of Respondents in Choosing a Mode

This research was conducted on people in Serang City who use City Transportation services and Online Motorcycle Taxis to Pakupatan Terminal - Kebon Jahe. In Table 1, which presents data on the average percentage of modes used by 100 respondents in Serang City, 73% stated that they had used both modes, and 27% stated that they had used one of the modes. Furthermore, the characteristics of respondents based on gender as presented in table 2, shows 58% male and 42% female. As for the reasons for choosing the mode in table 3, out of 43 respondents who used city transportation, 62.79% reasons for price considerations, 9.30% for ease of access considerations, 11.63% for convenience considerations, 9.30% for safety & security considerations, and 6.98% consideration of speed/time. While the reasons for 57 respondents using online motorcycle taxis are cost considerations 10.53%, considerations due to ease of access 17.54%, considerations due to convenience 14.04%, considerations due to safety & security 1.75%, and considerations of speed/time as much as 56.14%.

Table 1. Characteristics Based on Modes That Have Been Used

No.	Moda used	Frequency (n=100)	%
1	Ever used both modes	73	73
2	Never used one of the modes	27	27
	Amount	100	100

Table 2. Characteristics of Fashion Users Based on Gender

No.	Gender	Frequency (n=100)	%
1	Man	58	58
2	Woman	42	42
	Amount	100	100

Table 3. Mode User Characteristics, Based on Reasons for Choosing a Mode

No.	Considerations Choosing Mode	City Transportation		Online Motorcycle Taxis		Total Number
		Amount	%	Amount	%	
1	Price/Cost Considerations	27	62,79	6	10,53	33
2	Ease of Access Considerations	4	9,30	10	17,54	14
3	Convenience Considerations	5	11,63	8	14,04	13
4	Safety & Security Considerations	4	9,30	1	1,75	5
5	Speed/time considerations	3	6,98	32	56,14	35
	Total	43	100	57	100	100

Cost, Travel Time, Headway

The results of the data obtained in the field related to travel costs, travel time, and departure time (waiting time/time between vehicles) for the Pakupatan – Kebon Jahe Terminal route can be seen in table 4.

Table 4. Actual Mode and Service Attributes

No.	Travel Attributes	City Transportation	Motorcycle Online
1	Travel cost	Rp. 3000	Rp. 12000
2	Travel time	25 minutes	15 minutes
3	Headway	Every ± 15 minutes	Every ± 3 minutes

Reliability Test

The reliability test was carried out to measure the consistency of the respondents' answers to the question items in the questionnaire. The questionnaire can be declared reliable if the Cronbach's Alpha value test results are > 0,60. As presented in table 5, it is known that the calculation results for the question items asked (P1-P15) are 0,768. Thus, the questionnaire can be declared reliable because the value Cronbach's Alpha 0,768 > 0,06.

Table 5. Result of Reliability Test

Cronbach Alpha	*Items*
0,768	15

Validity test

Validity test is proof that the instruments, techniques and processes used in measuring a question are in accordance with the intended concept, or to measure the validity of an item. Question items are said to be valid if the corrected item-total correlation (r count) is more significant than r table. As for the SPSS calculation results, the validity of the instruments in this study is presented in table 6.

Tabel 6. Validity Test Results

Item	*Scale Mean if Item Deleted*	*Scale Variance if Item Deleted*	*Corrected Item-Total Correlation*	*Cronbach's Alpha if Item Deleted*
P_1	39.30	69.283	0.630	0.727
P_2	39.02	69.676	0.664	0.725
P_3	39.00	71.616	0.586	0.734
P_4	38.12	82.167	0.252	0.765
P_5	38.09	82.244	0.251	0.765
P_6	39.59	81.194	0.280	0.763
P_7	39.59	81.194	0.280	0.763
P_8	39.87	74.417	0.441	0.749
P_9	38.99	77.606	0.303	0.764
P_{10}	39.91	78.911	0.316	0.761
P_{11}	39.39	75.675	0.340	0.761
P_{12}	39.37	75.508	0.382	0.755
P_{13}	40.01	82.596	0.284	0.763
P_{14}	40.60	84.949	0.245	0.766
P_{15}	40.51	84.313	0.235	0.766

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In this study, the value of r table (df = n – 2 = 100 – 2, 95% significance level) is 0,1966. Based on table 6, the corrected item-total correlation has a value for each question of more than 0,1966. Thus, each question was declared valid, so no questions were omitted (P1-P15).

Data processing

At this stage a transformation process is carried out with the aim of changing the respondents' answers from qualitative data to quantitative data. Data changes are made based on a predetermined numerical scale. The determination of the scale is based on the linear equation of the binomial logit model (Tamim, 2008). The equation is as follows:

$$Ln = \frac{P}{(1-P)}$$

The transformation process from a point rating into a numerical scale is as follows:
(a) The value of the probability scale of rating points 1,2,3,4, and 5 is the standard scale value, namely 0.9; 0.7; 0.5; 0.3; and 0.1.
(b) The use of a linear transformation of the binary logit model aims to obtain a numerical scale value for each choice probability.

Table 7. Numerical Scale Value Based on Respondent's Choice

Probability Scale Value	Natural Logarithmic Value	*Point Rating*
0.9	2.1972	1. Choose City Transportation
0.7	0.8473	2. Maybe choose City Transport
0.5	0.0000	3. Balanced choice
0.3	-0.8473	4. Maybe choose Online Motorcycle Taxis
0.1	-2.1972	5. Choose Online Motorcycle Taxis

After the data transformation is obtained, the next step is to calculate the survey data on the respondents' choices regarding changes to one of the attributes obtained based on the modal conditions resulting from the preliminary survey.

Table 8. Research Questionnaire Survey Results Data

Resp.	Options	*Point Rating*	Numerical Scale Value	X_1	X_2	X_3
1	1a	3	0.0000	-4000	10	12
	1b	3	0.0000	-3000	10	12
	1c	1	2.1972	-2000	10	12
	1d	2	0.8473	-1000	10	12
	1e	3	0.0000	0	10	12
	2a	3	0.0000	-9000	-2	12
	2b	3	0.0000	-9000	-1	12
	2c	1	2.1972	-9000	0	12
	2d	5	-2.1972	-9000	1	12
	2e	1	2.1972	-9000	2	12
	3a	4	-0.8473	-9000	10	-2
	3b	1	2.1972	-9000	10	-1
	3c	2	0.8473	-9000	10	0
	3d	2	0.8473	-9000	10	1
	3e	2	0.8473	-9000	10	2

The explanation of table 8 is as follows:

(a) Respondent (1), travel costs (X_1) were obtained from changes in travel cost attributes, namely the difference in the cost of city transportation and online motorcycle taxis. In column 5, in option 1a, it is known that the cost of city transportation and online motorcycle taxis is 2000 – 6000 = -4000. Meanwhile, the travel time (X_2) remains in the current mode condition, namely the difference in travel time between City Transportation and Online Ojek, which is 25 – 15 = 10 minutes. Even so, the headway (X_3) remains in the current mode condition, namely the difference in departure schedules between City Transportation and Online Ojek, which is 15 – 3 = 12 minutes. Choice 1a shows a point rating of 3 (balanced choice) with a numerical scale value based on the mode user of 0.000.

(b) In option 2a, the travel time (X_2) is obtained based on changes in the travel time attribute, namely 15 – 17 = -2 minutes. Meanwhile, the travel cost (X_1) remains at the initial condition, namely the difference between city transportation and online motorcycle taxi travel costs of 3000 – 12000 = - 9000. Furthermore, the headway (X_3) remains at the current modal condition, namely the difference in departure schedules between city transportation and online motorcycle taxi 15 – 3 = 12 minutes. The calculation method as in option 1a.

(c) In option 3a, the headway (X_3) is obtained based on changes in the waiting time/headway attribute; namely, every 5 – 7 = 2 minutes. Meanwhile, travel costs (X_1) and waiting time (X_3) remain current. The calculation method as in option 1a.

Statistical F Test

Hypothesis testing on variations in utility values (F-test) is carried out to ensure the effectiveness of all the attributes that have the difference in utility equation together. From result of F-test, including all attributes in the comparison of City Transportation and Online Motorcycle Taxis, an F_{count} of 61,390 is obtained. Based on table 9, the value of $F_{count} > F_{table}$ (5%, Df1 = 3, Df2 = 1500 – 3 – 1 = 1496) or 100.699 > 2.62 and Sig. < 0.05, then H0 is rejected and H1 is accepted. Thus, the cost, travel time, and headway influence the mode selection utility.

Table 9. ANOVA Test Results

	Model	*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	*Regression*	603.744	3	201.248	100.699	0.000[b]
	Residual	2989.776	1496	1.999		
	Total	3593.520	1499			

Statistical t-test

Testing the hypothesis on the regression t-test was conducted to ascertain the effect of the independent variables on the dependent variable. The results of the t-test for each attribute are shown in table 10. Based on the calculation of the t table (df = n – k = 100 – 4 = 96), the value is 1.98498; it can be stated that from the three attributes as presented in table 10, all independent variables have an influence which is significant to the modal selection variable because the value of $t_{count} > t_{table}$. The influence of each variable is the travel cost attribute (X_1) which has a significant opposite effect on the choice of mode. Meanwhile, travel time and headway attributes have a significant positive/unidirectional effect on mode selection.

Table 10. t-test Results

Varibale	t count	Sig.	Conclusion
X_1	-11.296	0.000	H_0 rejected dan H_1 accepted
X_2	7.248	0.000	H_0 rejected dan H_2 accepted
X_3	5.807	0.000	H_0 rejected dan H_3 accepted

R Square test (R^2)

The value of R^2 is shown in table 11. Based on the results, that can be concluded from table 11 is the value of $R^2 = 0.168$. Thus, the attributes of travel costs (X_1), travel time (X_2), and headway (X_3)

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together have an effect of 16.8% in determining the choice of mode to use from Terminal Pakupatan - Kebon Jahe.

Tabel 11. R^2 test results

Model	*R*	*R^2*	*Adjusted R^2*	*Std. The error*
1	0,410	0,168	0.,66	1,414

Mode Selection Model Analysis

The results of the analysis obtained the equation for the difference between city transportation utilities and online motorcycle taxi routes for the Pakupatan Terminal - Kebon Jahe route presented in Table 12.

Tabel 12. Test Results for Utility Equations

Model		*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*
		B	*Std. Error*	*Beta*		
1	*(Constant)*	-4.425	0.531		-8.341	0.000
	X_1	-0.00038	0.0000334	-0.829	-11.296	0.000
	X_2	0.17288	0.0238523	0.534	7.248	0.000
	X_3	0.11609	0.0199926	0.429	5.807	0.000

Based on table 12, the utility difference equation between City Transportation and Online Ojek is:
$$\boldsymbol{U_{CT} - U_{OM} = -4.425 - 0.00038(X1) + 0.17288(X2) + 0.11609(X3)} \quad \text{.....(2)}$$

Furthermore, the differences in Utilities for option 1a, as presented in table 8, can be analyzed, and the resulting differences in Utilities for option 1a are as follows:
$$\boldsymbol{U_{CT} - U_{OM} = -4.425 - 0.00038(-4000) + 0.17288(10) + 0.11609(12) = 0.207}$$
Description:
U_{CT} = Utility or the value of City Transport mode selection
U_{OM} = Utilities or Online Motorcycle Taxis mode selection
Furthermore, the calculation of the mode selection probability analysis can be using the formula:
Probability of selecting the City Transport mode:

$$\mathbf{P_{CT} = \frac{1}{1+e^{UCT-UOM}} = \frac{1}{1+e^{(-0.2067)}} = 0{,}4485}$$

$$\mathbf{P_{OM} = 1 - P_{CT} = 1 - 0{,}4485 = 0{,}5515}$$

Description:
P_{CT} = Opportunity to choose the City Transportation mode
P_{OM} = Opportunity to choose the Online Motorcycle Taxis mode

The calculation results for the probability of choosing a mode based on changes in attributes are shown in table 13.

Table 13. Probability of Mode Selection based on Attribute Changes

Choice	**X_1**	**X_2**	**X_3**	**$U_{CT} - U_{OM}$**	**P_{CT}**	**P_{CT} (%)**	**P_{OM}**	**P_{OM} (%)**
1a	-4000			0.207	0.448	44.85	0.552	55.15
1b	-3000			-0.171	0.543	54.26	0.457	45.74
1c	-2000			-0.548	0.634	63.37	0.366	36.63
1d	-1000			-0.926	0.716	71.62	0.284	28.38
1e	0			-1.303	0.786	78.64	0.214	21.36
2a		-2		0.019	0.495	49.51	0.505	50.49

2b	-1	0.192	0.452	45.21	0.548	54.79
2c	0	0.365	0.410	40.97	0.590	59.03
2d	1	0.538	0.369	36.86	0.631	63.14
2e	2	0.711	0.329	32.94	0.671	67.06
3a	-2	0.469	0.385	38.49	0.615	61.51
3b	-1	0.585	0.358	35.78	0.642	64.22
3c	0	0.701	0.332	33.16	0.668	66.84
3d	1	0.817	0.306	30.64	0.694	69.36
3e	2	0.933	0.282	28.23	0.718	71.77
	Average Probability		0.456	45.64	0.544	54.36

RESULTS AND DISCUSSION

Travel Cost

Based on the results of the analysis shown in table 13, the probability of the mode selection model for each mode for changes in travel cost attributes and other fixed attributes is as follows:

(a) For changes in travel expense attributes in option 1a between City Transportation and Online Motorcycle with a difference of -Rp. 4000, - while the difference in other attributes remains by actual conditions, the probability for City Transportation is 44.85%, and Online Motorcycle Taxi is 55.15%. The results of this analysis show that the Online Motorcycle mode is more favorite than the City Transportation mode.

(b) For changes in travel expense attributes in option 1b between City Transportation and Online Motorcycle with a difference of -Rp. 3000, - while the difference in other attributes remains by actual conditions, the probability for City Transportation is 54.26%, and Online Motorcycle is 45.74%. The results of this analysis show that the City Transportation mode is more favorite than Online Motorcycle mode.

(c) For changes in travel expense attributes in option 1c between City Transportation and Online Motorcycle with a difference of -Rp. 2000 - while the difference in other attributes remains by actual conditions, the probability for City Transportation is 63.37%, and Online Motorcycle Taxi is 36.6%. The results of this analysis show that City Transportation mode is more favorite than Online Motorcycle mode.

(d) To change the travel cost attribute in option 1d between City Transportation and Online Motorcycle Taxi with a difference of -Rp. 1000, - while the difference in other attributes remains by actual conditions, the probability for City Transportation is 71.62%, and Online Motorcycle Taxi is 21.38%. The results of this analysis show that the City Transportation mode is more favorite than Online Motorcycle mode.

(e) To change the travel expense attribute in option 1e between City Transportation and Online Motorcycle with a difference of Rp. 0,- while the difference in other attributes remains by the actual conditions, the probability for City Transportation is 78.64%, and Online Motorcycle is 21.36%. The results of this analysis show that the City Transportation mode is more favorite than Online Motorcycle mode.

The probability graph for changing the travel cost attribute is shown in Figure 1.

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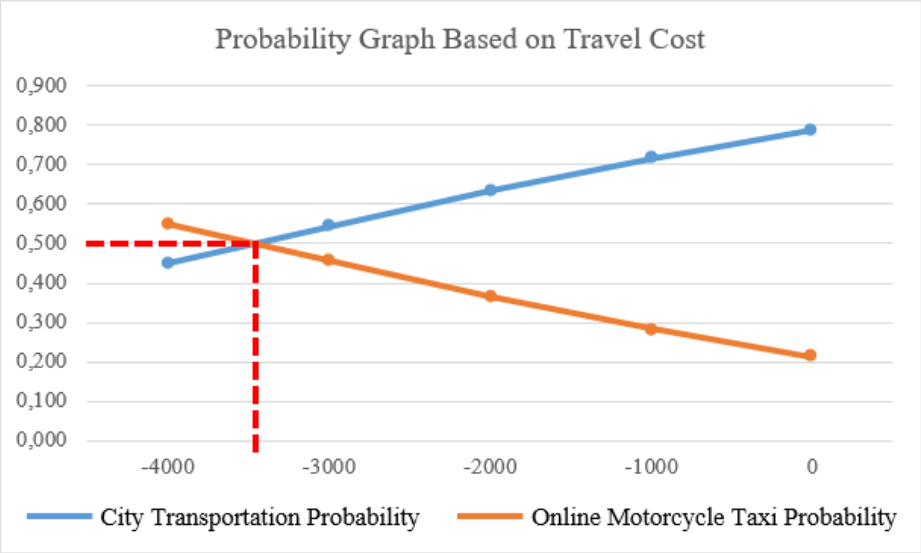

Figure 1. Graph of Mode Selection Probability based on Changes in Travel Cost Attributes

Travel time

Based on the results of the analysis shown in table 13, the probability of the mode selection model for each mode for changes in travel time attributes and other fixed attributes is as follows:

(a) For changes in the travel time attribute in option 2a between City Transportation and Online Motorcycle with a time difference of -2 minutes, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 49.51%, Online Motorcycle is 50.49%. The results of this analysis show that Online Motorcycle is more favorite than the City Transportation mode.

(b) For changes in the travel time attribute in option 2b between City Transportation and Online Motorcycle with a time difference of -1 minute, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 45.21%, Online Motorcycle is 54.79%. The results of this analysis show that Online Motorcycle is more favorite than the City Transportation mode.

(c) For changes in travel time attributes in option 2c between City Transportation and Online Motorcycle with a time difference of 0 minutes, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 40.97%, Online Motorcycle Taxi is 59.03%. The results of this analysis show that the Online Motorcycle mode more favorite than the City Transport mode.

(d) For changes in travel time attributes in option 2d between City Transportation and Online Motorcycle with a time difference of 1 minute, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 36.86%, Online Motorcycle Taxi is 63.14%. The results of this analysis show that the Online Motorcycle mode is more favorite than the City Transport mode.

(e) To change the travel cost attribute in option 2e between City Transportation and Online Motorcycle with a time difference of 2 minutes while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 32.94% and Online Motorcycle 67.06%. The results of this analysis show that the Online Motorcycle mode more favorite than the City Transport mode.

The probability graph for changing the travel time attribute is shown in Figure 2.

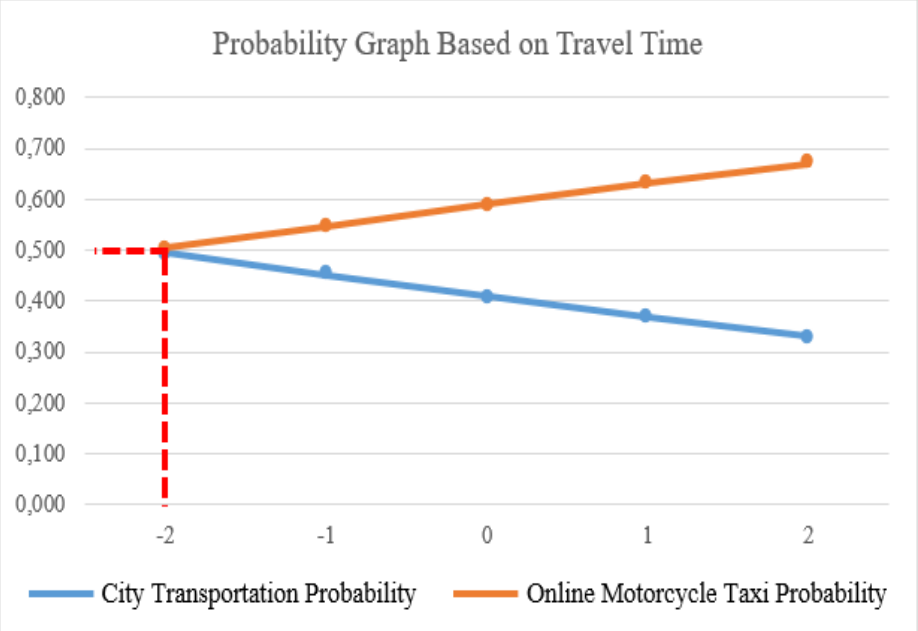

Figure 2. Graph of Mode Selection Probability based on Changes in Travel Time Attributes

Headway

Based on the results of the analysis shown in table 13, the probability of the mode selection model for each mode for changes in headway attributes and other fixed attributes is as follows:

(a) For changes in the attribute of departure time distance in option 3a between City Transportation and Online Motorcycle with a time difference of -2 minutes, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 38.49% and Online Motorcycle is 61.51%. The results of this analysis show that the Online Motorcycle is more favorite than the City Transportation mode.

(b) For changes in the attribute of departure time distance in option 3b between City Transportation and Online Motorcycle Taxi with a time difference of -1 minute while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 35.78% and Online Motorcycle is 64.22%. The results of this analysis show that the Online Motorcycle is more favorite than the City Transportation mode.

(c) For changes in the attribute distance of departure time in option 3c between City Transportation and Online Motorcycle with a time difference of 0 minutes, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 33.16% and Online Motorcycle is 66.84%. The results of this analysis show that the Online Motorcycle is more favorite than City Transportation mode.

(d) For changes in the attribute distance of departure time in the 3d option between City Transportation and Online Motorcycle with a time difference of 1 minute, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 30.64% and Online Motorcycle Taxi is 69.36%. The results of this analysis show that the Online Motorcycle more favorite over City Transportation mode.

(e) For changes in the attribute of departure time distance in option 3e between City Transportation and Online Motorcycle with a time difference of 2 minutes, while the difference in other attributes remains according to actual conditions, the probability for City Transportation is 28.23% and Online Motorcycle is 71.77%. The results of this analysis show that the Online Motorcycle is more favorite than the City Transportation mode.

The probability graph for changing the waiting time attribute is shown in Figure 3.

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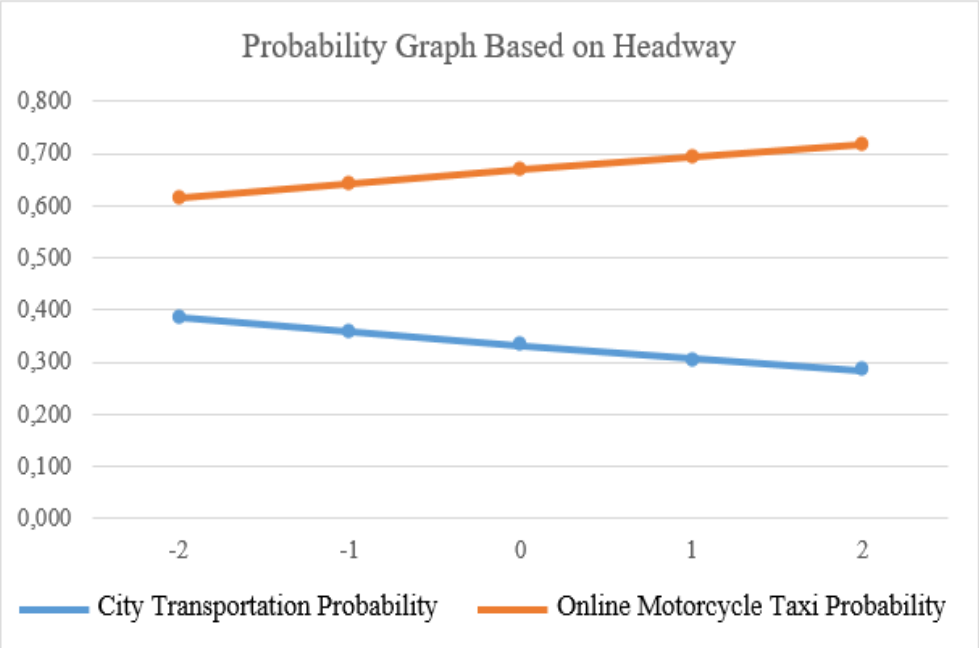

Figure 3. Graph of Mode Selection Probability based on Changes in Headway Attributes

Furthermore, based on all attributes, the City Transport mode has a probability of being chosen by travelers of 45.64%. In comparison, the Online Motorcycle mode has a probability of being selected at 54.36%. This is due to several factors, and the most important is the consideration that the cost of traveling using City Transportation is cheaper than the Online Motorcycle mode. The Opportunity for respondents to choose the Online Motorcycle mode is due to perceived speed/time considerations compared to City Transportation.

CONCLUSION

The mode selection model between City Transportation and Online Motorcycle Taxis, based on an analysis of the calculation of all the attributes in this study, namely City Transportation, has the opportunity/probability of being chosen by travelers in Serang City at 45.64%. The probability/chance of choosing an Online Motorcycle Taxi is 54.36 %. The magnitude of the probability value of City Transportation is possible because of the cheaper travel costs compared to Online Motorcycle. The Opportunity for respondents to choose to use the Online Motorcycle mode is a consideration of perceived speed/time compared to City Transportation. Furthermore, the demand for city transportation and online motorcycle taxis in Serang City based on the considerations of 100 respondents is that 43 respondents choose to use public transportation because 62.79% are price considerations, 9.30% are considerations of ease of access, 11.63% are considerations of convenience, 9.30% are considerations safety & security, as well as 6.98% accuracy/time considerations. At the same time, the reasons for 57 respondents choosing online motorcycle taxis were 10.53% cost considerations, 17.54% ease of access considerations, 14.04% convenience considerations, 1.75% safety & security considerations, and 56.14% speed/time considerations. Taking into account the results of the analysis of changes in all attributes in this study, the sensitivity of travelers in choosing the mode from Pakupatan Terminal to Kebon Jahe when changes in the attributes of travel costs in both modes are increased or decreased, travelers generally prefer to use City Transportation as a mode to get to places the goal. As for changes in the travel time attribute and the attribute distance of departure time/headway when being raised or lowered, travelers prefer using Online Motorcycle to get to their destination.

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