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The Mode Choice Model of Civil Servant Commuters in Makassar City

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Abstract
Analysis of people's mode selection behavior is crucial to any public transportation planning and management system. It may be used to gauge public interest in and preference for various forms of transportation. This article provides a comprehensive analysis of how and why consumers pick certain automobiles, motorcycles, and public transportation options. The study also hopes to learn why individuals prefer using the bus or train instead of driving themselves. Several variables influencing the selection of a mode were analyzed, and primary and secondary data were obtained to do so. The city of Makassar was surveyed in order to get primary data. Examining how government workers in Makassar get to and from work is the focus of this research. Using the Stated Preference method, 352 participants from various government agencies were surveyed and split into two groups. Multinomial logistic analysis was conducted using statistical testing and the STATA statistical program. The estimate of the quantitative model takes into account two sets of variables: personal traits and trip features. According to the results, this form of transportation has more value and likelihood of use than other modes.

Keywords: Mode Choice, Civil Servant, Commuters, Makassar, Transportation, STATA statistical program

1. Introduction
Makassar City's population is becoming increasingly dense due to the fact that it is growing at an alarming rate year after year. It is the most major need for migration in Makassar that has resulted in the highest population density in the city. It is becoming increasingly common for people to travel for recreational purposes within urban regions. Transportation networks and various modes of transportation are examples of the kind of infrastructure that must be made available to accommodate activity travel. The following is information on the demand for adventure travel in Makassar City, South Sulawesi's provincial capital. This study recommends that Makassar become a hub for Civil Service Commuters coming from and going to neighboring cities, including Maros, Gowa, and Takalar. JICA,(2007) On the basis of their preference for a means of transportation, two types of commuters move or travel: 1) The choice is a group of people who have the option of choosing how they will travel and who have access to private vehicles. In the second instance, the captive is a group of people who rely on public transportation to get around. An individual who leaves home without a private vehicle or who does not utilize a private vehicle is referred to as a captive user of public transportation. This individual has no other option except to take public transit. Riyanto & Dwi R,(2002) Many factors influence the decision to use this mode of transportation by people, including government officials (both public and private sector) and commuters, among which the journey attribute (which includes travel time and cost) is the most important. There are a variety of factors that deter-

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mine the method of transportation that is selected, including: Amelia and Yanita,(2008)

A. Characteristic system Transportation

When taking public transportation, travel time is comprised of vehicle time, waiting time, mode change time, and accessibility time. Evaluating trip times using public transportation with travel times using private transportation is standard practice when comparing travel times using both modes of transportation (car). Amelia and Yanita,(2008)

Travel Expenses The amount of the applicable fare represents the amount of money it will cost to travel by public transit. While using private transportation, travel expenditures will include a variety of components such as fuel, lubricants, parking, highway tolls, and other fees. When comparing costs, relative cost measurements are employed as a metric to compare costs. Amelia and Yanita,(2008)

Travel is defined as one-way movement from the origin zone to the destination zone, which may include walking motions. Despite the fact that the movement is compelled to adjust its direction, an accidental stop is not regarded to be the movement's purpose. Despite the fact that the movement is commonly defined as a return to one's home and a departure from one's home. The goal of the work and education movement is referred to as the central movement, and it is something that everyone must undertake on a daily basis. Other movement targets, on the other hand, are optional and do not need to be completed on a daily basis. According to Warpani S, a business trip is defined as a trip taken solely for the purpose of working. Working trips can take the form of shuttle trips, which are trips that take place every day and at the same time. A mode of transportation that is required and meets the standards is a mode of transportation that can reduce travel time or a means of transportation that can guarantee a specific period of time for commuting from home to work. There are no hurdles in the way of the journey's progression. Warpani & Suwardjoko,(1990)

B. Multinomial Logistics Regression Analysis

This study's method is logistic regression with the dependent variable on a nominal scale with three categories. Ratna & Kutha N,(2012) The logistic regression probability function for each category can be seen in equations of 1, 2, and 3:

$$\pi 1\,(x) = P(Y = 1 \mid = \exp g1\,(x) / (1 + \exp g1\,(x) + \exp g2\,(x)\,!\,) \ldots \quad (1)$$

$$\pi 2\,(x) = P(Y = 2 \mid x) = \exp g2\,(x) / (1 + \exp g1\,(x) + \exp g2\,(x)\,!\,) \ldots \quad (2)$$

$$\pi 3\,(x) = P(Y = 3 \mid x) = 1 / (1 + \exp g1\,(x) + \exp g2\,(x)\,!\,) \ldots \quad (3)$$

$$\text{Logit } P(Y \leqslant j \mid xi) = \log ((P(Y \leqslant j \mid xi)) / (P(Y > j \mid xi))) \ldots \quad (4)$$

Logit function with response variable

$$gj\,(x) = \log ((P(Y \leqslant j \mid xi)) / (P(Y > j \mid xi))) = \beta\, j0 + \beta\, j1x1 + \beta\, j2x2 + \ldots + \beta\, jpXp \ldots \quad (5)$$

2. Methods

2.1. Location Research

Civil Servants who work in a variety of service offices and who commute to and from work on a daily basis, including the Department of Transportation, the Office of Marine, Fisheries, Agriculture, and Animal Husbandry, the Department of Social Service, the Service Population and Civil Registry, the Office of Cooperatives and Small and Medium Enterprises, the Youth and Sports Service, the Department of Culture and Tourism, were the target of this research, which was conducted in Makassar City.

2.2. Data Collection

This stage consists of 2 stages, namely secondary and secondary collection of data.

a. Secondary Data

Secondary data is information that has been gathered in a secondary manner and is used to supplement original data. Secondary data was gathered from government entities in Makassar City, which was entered into a database and analyzed. Information received includes names of employees from Makassar city government agencies, as well as the number of employees, the addresses of employees, and their positions and classes.

b. Primary Data

Primary data collection consists of several stages, among others:

1. Quizoner Design

This study used the respondents' stated preference survey method, so it used the interview

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No	Agency/Offices	Samples
1	Park Service Agency	21
2	Income of Region Agency	35
3	Health Agency	40
4	Communication and Information Agency	10
5	Labor Agency	25
6	Education and Culture Agency	21
7	Fire Agency	12
8	Public Work Service Agency	10
9	Transportation Service Agency	19
10	Cooperatives and Small Medium Enterprises Agency	14
11	Housing and Local Government Building Agency	44
12	Culture and Tourism Agency	14
13	Industrial Agency	22
14	Spatial Planning Agency	6
15	Social Agency	6
16	National Land Agency	13
17	Regional Civil Service Agency	27
18	Municipal Agency Lt.1	13
	Total	352

Table 1.
Name and Number of Samples for Each Agency/Office

method through a questionnaire. In order for the information provided by respondents to match the desired data in this study, it is necessary to plan a questionnaire.

2. Determine the number of samples

To obtain data with an accuracy level of 95% and an error rate of not more than 5%, the Slovin formula is used.

Individual preference parameters were constructed and calculated using the random utility maximization approach, which was used in this study for the first time. Train K E,(2009) Koppelman F S and Bhat C,(2006) As a result, our investigation makes use of Multinomial Logistic Regression Multinomial regression is a regression model that is used to handle regression scenarios when the dependent variable is qualitative data and there are one or more independent variables. The dependent variable can be either a single category or a multinomial (with more than two categories).

Characteristic Responden	Categori Characteristic
Gender	a. Male b. Female
Age (Years Old)	a. <30 c. 41-50 b. 31-40 d. >50

Table 2.
Category Characteristic Respondent

Table 2. Continue...

Education	a. Elementary School e. Bachelor b. Junior High School f. Master c. Diploma (D3) g. Others d. Diploma (D4)
Income (IDR)	a. < 2.000.000 d. 4.000.000-5.000.000 b. 2.000.000-3.000.000 e. > 5.000.000 c. 3.000.000-4.000.000
Moda	a. Cars d. Taxibike b. Motorbikes e. Walking c. Public Transportation
Distance (Meters)	a. < 200 d. 1000-5000 b. 200-500 e. 5000-10000 c. 500-1000 f. >10000
Travel Cost (IDR)	a. 0 f. 15.000-30.000 b. < 5.000 g. 30.000-40.000 c. 5.000-7.500 h. 40.000-50.000 d. 7.500-10.000 i. >50.000 e. 10.000-15.000

Table 2. These questions categories include all questions regarding the respondents' characteristics and all questions about the qualities of commuter travel for Civil Servants in Makassar City. All questions above are answered by Stated Preference, with a particular emphasis on transportation mode, journey time, and travel expenditures, all of which are more prominent in this study than in others.

Questions Responden	Categori Characteristic	Frequency	Percentage (%)
Gender	Male	145	41.19
	Female	189	53.69
	Others	18	5.11
Age (Years Old)	<30	50	14.20
	31-40	102	28.98
	41-50	95	26.99
	>50	48	13.64
	Others	57	16.19
Education	Elementary School	2	0.57
	Junior High School	54	15.34
	Diploma (D3)	11	3.13
	Diploma (D4)	3	0.85
	Bachelor	165	46.88
	Master	49	13.92
	Others	68	19.32

Table 3.
Total Characteristic Respondent

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Table 3. Continue...

Income (IDR)	< 2.000.000 2.000.000-3.000.000 3.000.000-4.000.000 4.000.000-5.000.000 > 5.000.000	51 112 116 52 21	14.49 31.82 32.95 14.77 5.97
Distance (Meters)	< 200 200-500 500-1000 1000-5000 5000-10000 >10000	7 19 40 128 79 79	1.99 5.40 11.36 36.36 22.44 22.44
Travel Cost (IDR)	0 < 5.000 5.000-7.500 7.500-10.000 10.000-15.000 15.000-30.000 30.000-40.000 40.000-50.000 >50.000	7 25 48 63 79 79 20 14 17	1.99 7.10 13.64 17.90 22.44 22.44 5.68 3.98 4.83

3. Result and Discussion

3.1. Result

Respondents' responses aspects in terms of results Table 3 displays the findings of the survey, which received 352 responses, with the majority of them coming from women. In contrast, the most common age was 31-40 years old, and the most common level of education was Bachelor 165 people, while the most common distance and travel costs were 1-5 kilometers and IDR 10.000-30.000, respectively, while the most common distance and travel costs were 1-5 kilometers and IDR 10.000-30.000. The Final Product of the Models The findings of the Multinomial Logistic Regression model, which took into account the level of significance of the variables in the questionnaire data, are shown in the following tables: Table 4 and Table 5.

Variabel	Cars		Motorbikes		Public Transportation	
	Coef.	P(Value)	Coef.	P(Value)	Coef.	P(Value)
Time	0.04468	0.442	0.149358	0.030	-0.83075	0.002
Cost	0.677025	0.000	0.382228	0.001	0.567303	0.001
Number of obs						352
Prob > Chi2						0.000
Pseudo R2						0.1521

Table 4.
The Calculation Result of Model-1

When the number of observations is 352, the level of significance with MNL for each operator category is 0.000, indicating that the independent variable influences the dependent variable. The value pseudo,R-2.= 0.1521, which indicates that the independent variable can only explain as much as 15% of the dependent variable, is also presented in Table 4. Based on the findings of the MNL model, it can be seen that all time and cost P (Value) parameters are less than 0.05.

Variabel	Taxibike		Walking	
	Coef.	P(Value)	Coef.	P(Value)
Time	-1.42357	0.211	0.249175	0.553
Cost	-0.43052	0.529	-13.945	0.985
Number of obs				352
Prob > Chi2				0.000
Pseudo R2				0.1521

Table 5.
The Calculation Result of Model-2

When comparing the three operator categories, the level of significance with MNL is 352 data points with Prob> Chi2 of 0.000, which indicates that the independent variable affects the dependent variable, and with a pseudo R2 of 0.1521, which indicates that the independent variable can only explain the dependent variable by 15%, as shown in the estimation results presented in Table 5. Because all time and cost P (Value) parameters are greater than 0.05 in the MNL model, it may be concluded that the independent variable has no substantial influence on the dependent variable, according to the results obtained using the MNL model.

Mode Transportation	Prequency	Persentage (%)
Cars	87	24.716
Motorbikes	211	59.943
Public Transportation	38	10.795
Taxibike	13	3.693
Walking	3	0.852

Table 6.
The Calculation Result of Model-2

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3.2. Discussion

Models 1 and 2 demonstrate that the time and cost factors have a significant impact on the commuter transport mode chosen by civil servants in Makassar. These results are directly proportionate to the outcomes of selecting the model that likes to emphasize time and cost will be the preferred method of transportation, with cars, motorcycles, and public transportation being the most popular. People who picked taxis, bicycles, and walking, on the other hand, did not place a high value on the time and expense of the trip.

4. Conclusion

This study examines commuter travel for Makassar City civil servants, specifically the impact of the attributes of travel cost and travel duration on the mode of transportation that a commuter chooses. As a result of the findings, this research can conclude that commuter Civil Servants who prioritize travel time and cost will be more likely to use modes of transportation such as cars, motorcycles, and public transportation. In contrast, commuter Civil Servants who do not prioritize travel time and cost will be more likely to use modes of transportation such as public transportation. Travel time and cost are influenced by the mode of transportation chosen, which includes taxis, bicycles, and walking.

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