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The influence of socio-demographic and activity-travel participation variables on mode choice for the new railway development in South Sulawesi, Indonesia (Case: Makassar-Parepare Line)

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Abstract. The abstract The present study attempts to explore the influence of socio-demographic and activity-travel participation variables on mode choice of the new railway development for inter-city travel in the eastern part of Indonesia, namely Makassar - Parepare Line. The study carried out an interview survey on private car passengers, who have conducted travel for Makassar - Parepare route. A statistical descriptive analysis approach was applied to show the influence of the variables for the mode choice phenomenon of the travelers. The analysis results show that the socio-demographic variables more influence than the activity-travel variables on the mode choice behavior for the intercity travelers.

Keywords: Mode choice; socio-demographic, diary activities; travel pattern

1 Introduction

Logistic and transportation services are playing an important role in recent years, especially for South Sulawesi Province. The government by the Ministry of Transportation has been constructing a new railway track that connected Makassar as the central city of the province to Parepare city [1]. This study is interviewed each traveler of the chosen mode of transport and possible alternative modes

according to socio-demographic and diary activities. This approach provides a means of explaining current mode choice in terms of individual travel needs, preferences, and constraints, which are impossible regarding the new railway development of railway [2]. It also forms the current condition people's choice might be affected by the possible changes in the transport system and various measure design to increase the proportion of travels made by public transport [3]. The scope of the study was restricted to the traveler within the Makassar-Parepare line which travels by car, is likely to involve using the road network, or if made by public transport, are more likely to involve trains than buses. The previous study reflects a representative of the proportion of mode choice preference between railway and car for Makassar-Parepare line. The passenger's choices, according to the conditional logit model on the stated preference method. The study showed the passengers prefer to choose one of both travel modes when the mode has travel time faster than the other one, as well as for the lower travel cost. In addition, the inter-city travelers more considered the transfer travel cost attribute than the transfer travel time attribute when they face both travel mode choice the new railway mode, and the existing private car mode [4]. Regarding this, the choices can be explained quite simply in terms of mode differences travel due to socio-demographic and diary activities. The mode choice is based on the stated preference interviews with selected respondents or travelers.

The mode choice has been developed for distinguishing the people who prefer to choose the car, likely to the car, likely to the railway, and prefer to the railway in accordance with the condition of socio-demography and diary activities. The peoples are concerning the choice of travel modes according to their trip purpose that required to be fulfilled [5]. Considering the individual characteristics and activity travel participation affects the mode choice will be effective for establishing transport networks [6].

2 Study Method

This study is using the Stated Preference (SP), and travel diary activities to individual journeys including the chosen mode of transportation, alternative modes, the diary activities related to the preference of mode choices. The variables in the SP is set as a preference to consider the choice of an alternative mode between the railway and private car. This approach provides the current mode choices based on the stated preference scenario of attributes [7]. It also forms the predictions of the future choices of people that may be affected by the activity travel and individual variable [8]. Basically, the respondents of this study are selected randomly to peoples who have been traveling from Makassar-Parepare. The respondents were considered more beneficial to choose the mode choices according to the different socio-demography backgrounds and also travel activities. Then, the response of respondents due to the SP scenarios then clustered into mode choice preference such

us prefer to use the car, likely to use the car, likely to use the railway and prefer to use the railway. In practice it was considered the clustered according to the socio-demographic background (age, purpose, and frequency) and the travel diary activities.

2.1 The study area selection

The Parepare city is located on the north side of Makassar as a central city of South Sulawesi. The locations of the study area were chosen as the representatives of respondents are the travelers who have been traveled from Makassar-Parepare use a private car. Also, the travelers were based on the available information of mode choice preference due to the development of the railway. Most of the respondents come and stay in Parepare city as the location of the last station of the current plan of the railway. The railway track length from Makassar is about 142 kilometers, and through regency area, such us Maros, Pangkep, and Barru [9]. The important things also the respondents are residents of Parepare city and have been traveling by car through Makassar-Parepare. The track of the new railway through the north side to the central Province of Sulawesi. The railway track is shown in figure 1.

Fig. 1. The route of the railway for Makassar – Parepare line [10]

2.2 The data collection

The survey is conducted with an interview by using the questionnaire form. The data collection of respondents is selected randomly in Parepare city. The total respondents are 250 that participate in the survey. The questionnaire of this study carried out the characteristics of socio-demography age, frequency of travel, and trip purpose. The participation of travel involves the diary activities also involved

in questionnaires.

2.3 The data analysis

The stated preference scenarios, the socio-demographic, and the diary activities in the questionnaire then used to analyze. The result is aimed at describing the socio-demographic and travel participation in diary activities. İt was used for predicting the influence mode choice preference could be influenced. Basically, the result shows the clustered mode choice preference (railway/Rw and car) due to the socio-demographic and travel pattern activities. The SP scenarios are based on the assumption in table 1.

Table 1. The scenarios of Stated Preference

Code	Cost		Time transfer (hours)		Frequency		Cost transfer		Time transfer		Condition group
	Rw	Car	Rw	Car	Rw	Car	Rw	Car	Rw	Car	
A	100	150	2	3	4	any	0	0	45	0	Prefer to car
B	100	150	2	3	2	any	50	0	45	0	
C	100	150	3.5	3	4	any	50	0	20	0	
D	100	150	3.5	3	2	any	0	0	20	0	Both of modes
E	175	150	2	3	4	any	50	0	20	0	
F	175	150	2	3	2	any	0	0	20	0	Prefer to railway
G	175	150	3.5	3	4	any	0	0	45	0	
H	175	150	3.5	3	2	any	50	0	45	0	

The attributes of stated preference scenarios are cost, time transfer, frequency, cost transfer, and time transfer. Each scenario is set to select the mode choice group preference, and it is also has a value. First, the group that prefers private car mode, second is likely to both modes, and the group that prefers to the railway. The response to the SP is then clustered into quartile that classified the mode choice likelihood. Regarding this, quartile is also implemented in the travel pattern activity.

The diary activity is the cluster in a group of actors for whole criteria. The activities are selected and categorized into in-home (IH), out home (OH) activity, online and offline activity. More briefly of the diary activity cluster is shown on the following table 2. It shows the various activity with codes and clusters. The response of diary activities then correlated to the SP preference and shows the influence of the mode choice due to the travel activity pattern.

Table 2. Diary activity criteria

Code	Activity	Cluster Code
A	Sleep	IH mandatory
B	Self-help: take a bath, dressing, etc	IH mandatory
C	Eat & drink at home	IH mandatory
D	Offline rest (watching tv, listening radio, etc)	IH leisure

E	Online rest (Browsing, social media, etc)	IH online, if OE (OH online)
F	Social activity with family	IH leisure
G	Households activity	IH maintenance
H	Take care toddler, infant, etc	IH maintenance
I	Work	IH mandatory, if OI (OH mandatory)

Table 2. (continued)

Code	Activity	Cluster Code
J	In travel	Travel time
K	Site work	OH mandatory
L	Delivery purchasing	OH mandatory
M	Study	IH mandatory, if OM (OH mandatory)
N	Field trip study	OH mandatory
O	Eat & drink outside	OH maintenance
P	Grocery shopping	OH maintenance
Q	Online shopping	IH online
R	Sight-seeing shopping	OH leisure/social
S	Organization activity	OH leisure/social
T	Sport	OH leisure/social
U	Medical check	OH maintenance
V	Pick-up family	OH mandatory
W	Vacation	OH leisure

The activity-travel pattern with the response of stated preference describes the total time of respondents for the whole day. The pattern then shows the preference of mode choice in quartile. The trend of the pattern of each mode choice then shows the characteristics of diary activities of respondents related to the mode choice preferences.

3 Result and Discussion

The result of this study has investigated the factors that affect the mode choice preference of peoples due to the socio-demographic condition and travel activity pattern. Being the mode choice preference that influenced by the socio-demographic and travel patterns shows the likelihood of people in transportation mode.

3.1 The Characteristic of Socio-Demographic

The characteristics of socio-demographic consists of age, frequency, and trip purpose are shown in the table 3,4,and 5. Table 3 is shown the distribution of the age range of respondents. The rage age from 36-41 is dominant into the total respondent exists as much as 56 people, followed by age 30-35 and age 42-47. The

majority of respondents are in middle-age and work-age.
As for the respondent's frequency is recorded during a trip as long as a week for Makassar-Parepare line. According to table 4 shows that the majority of respondents are in two times a week to do travel with 90 respondents, followed by just one time a week do travel with 80 for Makassar Parepare line. Otherwise, only five respondents with every day made travel through this line.

The other characteristics are shown in table 5. It is indicated that the purpose of travel is dominant to visit family as much as 50.4% through the Makassar-Parepare line, and the second is the purpose of travel go to work as much as 39.2%. Only a small number of respondents traveling with recreation purposes.

Table. 3. The age characteristics

Class	Interval	Frequency
1	18 - 23	29
2	24 - 29	24
3	30 - 35	48
4	36 - 41	56
5	42 - 47	44
6	48 - 53	28
7	54 - 59	11
8	60 - 65	6
9	66 - 71	4
Total		250

Table. 4. The frequency of travel characteristics

Frequency (times/ week)	1	2	3	4	5	6	7
Total Respondents	80	90	29	29	13	4	5

Table. 5. The purpose of travel characteristics

Purpose	Percentage
Work/ Bussiness	39.2
Family visit	50.4
Recreation	3.6
Others	6.8

The socio-demographic characteristics may reflect to indicate the differences in mode choices preference. The preference has investigated the socio-demographic that represent the respondent's age, frequency, and purpose of travel.

3.2 The Response of Stated Preference (SP) with Socio-Demographic

This section involves the mode choices preference w[10] considering the socio-demographic. The response of SP in the quartile system shown in figure 2, figure 3, and figure 4 below. The figure shows the condition of the response group that majority respondents of SP ABC, DE, and FGH due to the age are likely to be younger travelers, whereas the ones who prefer to use the car are the ones who are on working-age between 23 – 45 years old as much as 84 total respondents in fig 2.

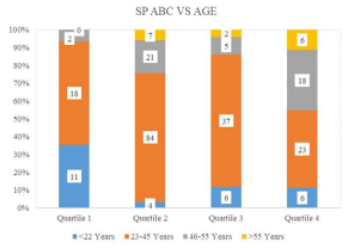

Fig. 2. The stated preference ABC to the characteristics age

Meanwhile, similar trend also occurs in figure 3 and figure 4. The ones who likely to use the car are in working-age and a small number of respondents in >55 years.

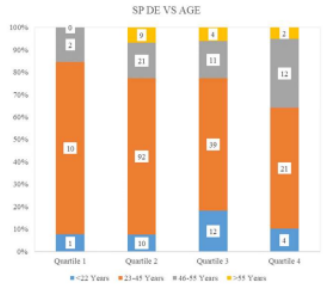

Fig. 3. The stated preference DE to the characteristics age

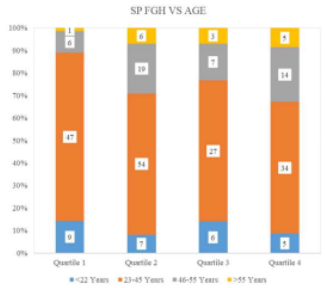

Fig. 4. The stated preference FGH to the characteristics age

There are no significant between the other response of SP ABC, SP DE, and SP FGH for the average range of age. This suggests that in mode preference choices between car and railway are not significant differences are the young travelers.

3.3 The Response of Stated Preference (SP) with Purpose

Respondents who had made travel with mode choices are majority the ones who had traveled with family visit followed by the purpose for work/ business shown in figures 5, 6, and 7. Especially for figure 5, it is indicated that the ones who have likely to use the car are the ones with work/business purposes.

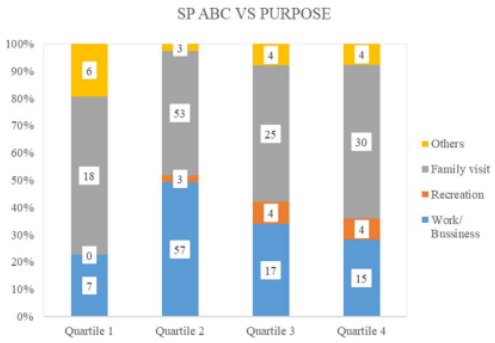

Fig. 5. The stated preference ABC to the purpose

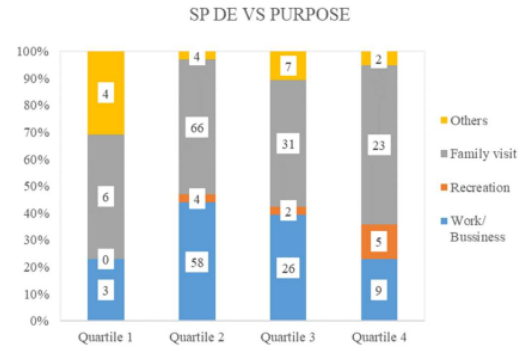

Fig. 6. The stated preference DE to the purpose

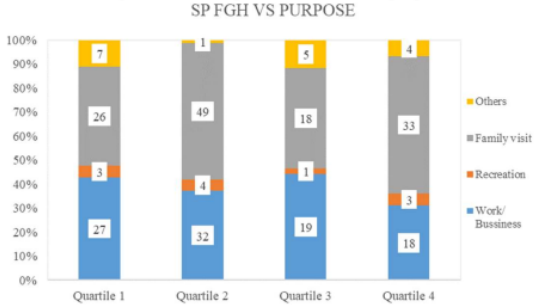

Fig. 7. The stated preference FGH to the purpose

Figure 6 and figure 7 also have a similar response to the stated preference of DE and FGH. It is indicated that the respondent's majority traveling to family visits and also to work/business. The trend of the result that there is no significant difference in purpose. Related to the distance for the trip Makassar-Parepare as mention before, totally the SP response to the purpose characteristics is not significant due to stated preference. Only a small number of respondents who has travel purpose with recreation.

3.4 The Response of Stated Preference (SP) with Frequency

The frequency of respondents Parepare is the majority with one to two times a week, followed by three to five times a week. The preference of transportation mode according to the frequency, are shown in figures 8, 9, and 10. Especially, the ones

who likely to choose cars are the respondents with frequency travel 1-2 times shown in figure 8.

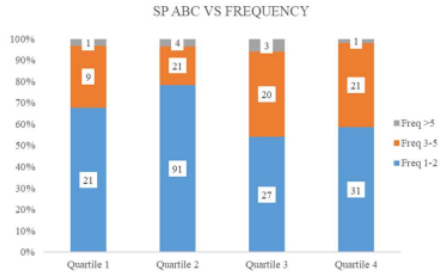

Fig. 8. The stated preference ABC to the purpose

The phenomena of these also occur in the other group stated preference, SP DE and SP FGH in figure 9 and figure 10. Overall, the response of respondents who likely to choose car and railway are the ones who have travel or frequency is 1-2 times a week. Only a small number of respondents have responded with travel frequency more than five (>5) times a week.

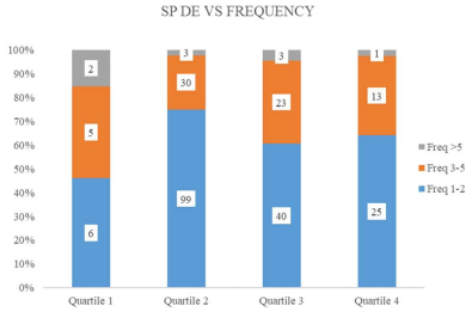

Fig. 9. The stated preference DE to the purpose

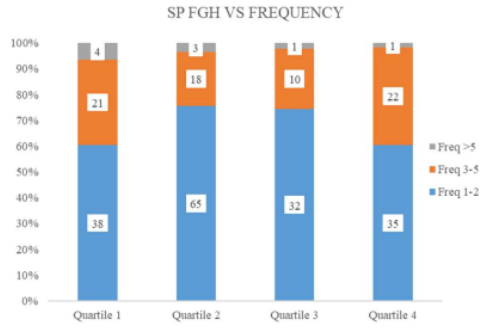

Fig. 10. The stated preference FGH to the purpose

3.5 The Quartile of Passengers Regarding Diary Activities

The alternative transport modes for car and railway are considering the diary activities pattern given as the reason for differences in time activities shown on bellows figures 11, 12, and 13.

The quartile of passengers or pattern activities shows that the total respondent spends their times for whole in-home mandatory activities shown in the figures. Figure 11 shows that the diary activity pattern indicates that the ones who have likely to choose the railway has spent more time on in-home mandatory, followed out-home activity, in-home leisures, in-home maintenance, out home leisure, time of travel, and last is out of home maintenance.

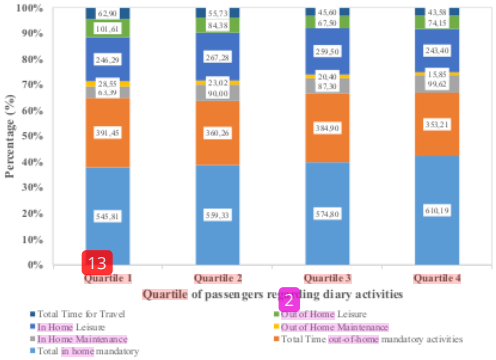

Fig. 11. The quartile of passengers regarding diary activities for SP ABC

The diary activities pattern also similar to the response of stated preference DE and FGH in figure 12 and figure 13. The trend of the respondent's pattern activities forms the time activities are more spent much time in-home mandatory, out-home mandatory, in-home leisure, in-home maintenance, out-home leisure, travel, and out-home maintenance for whole mode choice preference.

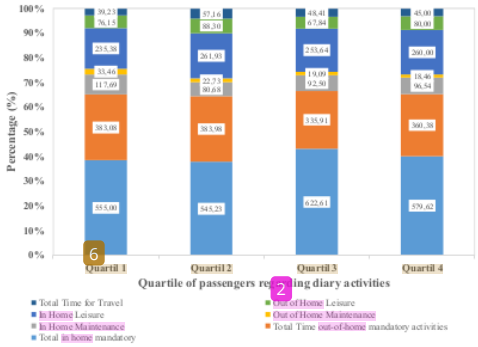

Fig. 12. The quartile of passengers regarding diary activities for SP DE

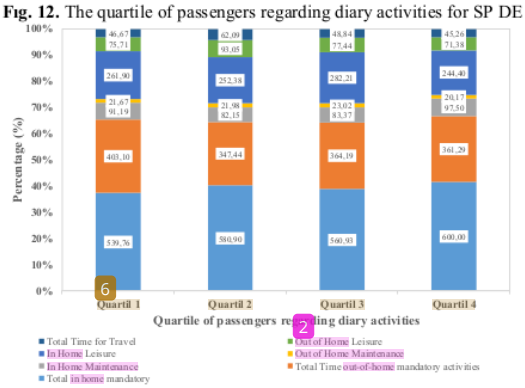

Fig. 13. The quartile of passengers regarding diary activities for SP FGH

The more common response of spending much time in diary activities sequence are in home mandatory activities, out-home mandatory, and in-home leisure activities. As mention before that the in-home mandatory are activities such as sleep, self-help, eat, and work in the home, total time out-home mandatory (work, site work, delivery purchasing, study, and pic-up family) and in-home leisure (a social activity with family) are majority implying the travel pattern activities. For whole figures of the

activity-travel pattern shows the similarities whether they prefer to choose the car or railway. Only a small number of respondents spend their time activities for out-home maintenance. Overall, the travel activity pattern indicates that there are no significant differences between the stated preference regarding the travel pattern activities.

4 Conclusion

The aims of this study are to find the influence of socio-demographic and the travel pattern activities on mode choice preference. The analysis results show that the socio-demographic variables more influence than the activity-travel variables on the mode choice behavior for the intercity travelers. Moreover, socio-demographic and travel activity does not significantly affect totally mode choice preference. Overall, the respondents who travel to Makassar-Parepare car and railway not significantly affected by the condition of socio-demography and diary activity. They are currently traveling and the underlying reasons for their choices according to the provided information. Generally, the choices can be flawed through the unclear information about the alternative. Further, the result would be expected to have different preference choices of transportation mode with more detail consideration scenarios in stated preference.

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