

ANALYSIS OF TRANSPORT MODE PREFERENCES FOR WORK TRAVEL IN MEDAN

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Abstract: This study aimed at finding factors that affected transport mode preferences for work travel in Medan. Improvements in public transport services combined with various tariffs assumed in case study were to observe the behaviours of the *choice* and *captive* travellers. This study was done as an applied study for the third level of students at University of Sumatera Utara (USU) about organizing data statistically by emphasizing the procedure and process of obtaining data through questionnaires and home interview. The location of study area was at the National Residence of Simalingkar Medan. The factors which can influence transport mode preferences for work travel in Medan were gender, ages, income levels, kinds of job, policy systems of public transport, travel time and travel costs. Second, apparently the quality improvement of public transport services with higher tariffs would not be successful to *choice* travellers in Medan especially for residents in the study area.

Key Words: *choice* travellers, *captive* travellers, travel time, travel costs, policy systems of public transport.

1. INTRODUCTION

1.1. Background

The development in Indonesia has increased the living standard and income of community and private vehicle ownerships. These consequences become traits of developing countries. The further consequences are more consumption on fuel, noise and air pollutions, accidents, delay, traffic jams and environmental damages. In addition, the attractiveness power of the cities, such as: the availability of job fields, more qualified schools and public service facilities cause urbanization that can add population to large cities. The increased population causes transport demands, which are roughly equal to the increased population itself. Ease, comfort, the accessibility of transport means and procurement of public transport services can also add a number of travels (Dimitrou 1990, p. 18 - 53).

Commonly, individuals usually want their lives easy, comfortable, free and prestigious in executing their daily activities. Therefore, they prefer to have private vehicles for their travel needs. According to Mulyanto (1995), in Semarang (Mid Java Province) many still do not have private vehicles yet, especially cars. If it is not possible for them to use non-motorized vehicles (e.g.: bicycles), then they will use public transport.

Mulyanto (1995) argues that the main trait of public transport systems in majority areas of Indonesia is the domination of *captive* travellers. Consequently, market condition tends to be *seller's market*. It means that the levels of public transport service are determined by public transport organizers. Consequently, this situation decreases the quality of public transport services. Bangun (2000) supports that in Medan the evidences of this situation can be identified by overcrowded passengers at peak hours and long duration of travel time caused by a number of public transport stops too long in order to obtain a sufficient number of passengers. In addition, there are too many public transports operate at the same time and in the same routes cause drivers disobey the traffic rules in order to reach the money target daily. The further implication of this situation is public transport services become less attractive so that travellers are more reluctant to use them.

Many indicators determine travel quality using public transport, which are varied from access time to closest terminals and seats availability. In addition, the attributes are relatively valued in different consequences by each traveller. According to Mulyanto (1995, p. 11 – 12), the number of public transport users can be increased by three significant factors. Firstly, maintaining public transport services that consist of the ease, accessibility, reliability, regularity, punctuality, total travel time and information systems. Secondly, organizing and considering external factors such as: population, activities concentration, travel distance, income and policy systems including transportation, districts, parking and tax policy systems. Finally, considering private factors that consist of social behavior, convenience, comfort, safety, social status and the values of time.

Time value has different meanings for people in developing and developed countries. Norojono (1990) discovers that improvement in travel time using public transport did not add new passengers in Jogjakarta (southern side of Java Island). He discovers that increasing frequency and improving the services of public transport would not add new passengers. He argues that it probably represented an illustration of the domination of captive travelers towards public transport in developing countries. He also argues that time value may not have an important meaning in developing countries. He analyzes that it was probably caused by the culture patterns of community or by *too far* distance of travel, so that small changes of travel time were seen as having no meaning.

Similar results in improving travel time also occurred in Semarang (Mulyanto, 1995). As an example, an interesting case that occurred in Semarang (Province of Mid Java) when it was tried to give an alternative for public transport users by providing PATAS DAMRI buses. According to Mulyanto (p. 13), the buses routes were from the Banyumanik Residential area to the *central business district (CBD)* in city centre. The buses had soft seats, full – music and air conditioners, but the tariff was 2.5 times as much as normal tariff. Evidently, the buses operated only for three months, because the operation was not profitable. Only few passengers used them.

From the viewpoints above, it is important to find factors, which can affect the preferences of transport modes, particularly for work travel in Medan. In addition, the sensitivity of travellers' attitudes and behaviour in making their preferences on the available transport modes, if there is a variety of transportation system policies assumed in the study area, also needs to be observed in order to find the salient factor that affect transport mode preferences

for work travel in Medan, which is the third largest city in Indonesia after Jakarta and Surabaya.

2. PROBLEM LIMITATIONS

2.1. Problems

In fulfilling daily needs, individuals need to work in order to earn certain amount of money. Generally, they have to travel from homes to work places and vice versa. However, because of the development of cities, travel distance and time become longer. It is not easy anymore for them to own residences, which are close to work places or to Central Business District (CBD). Therefore, many residences are built at suburban areas due to relatively cheaper land prices.

Not everyone owns private vehicles in Indonesia. However, supported by the availability of credit facilities of private vehicles ownerships for motorized vehicles, people try to possess one. As long as there are no restrictions or problems, then individuals will be free to use private vehicles. However, because of the problems of traffic jams, accidents, delay, air or noise pollution, parking and expensive fuel, then they turn to consider using public transport. Nevertheless, certain travelers will not change to become public transport users for particular reasons, although they have difficulties in using private vehicles. For instance, they have to spend much money to maintain the vehicles. On the other hand, travelers who usually use public transport may change to use private vehicles, if the income has increased and they are able to own private vehicles.

The description above appoints to questions: “Why travelers prefer to use their private vehicles for work travel more than public transport?” or “Why travelers prefer to use public transport for work travel although they have private vehicles and are able to use them?”

From the question above, there are several interesting factors to be observed:

1. Travellers’ characteristics: gender, ages, income levels and certain kinds of job.
2. Public transport characteristics: travel costs, travel time.
3. Reasons for using and not using the available transport modes.
4. The sensitivity of travellers’ attitudes and behaviours in making their preferences for one of available transport modes if there were five varieties of public transport systems policies, which were assumed in this study. It means that whether the respondents would change their decisions to use public transport or not if five varieties of public transport system policies were assumed in this research (Mulyanto, 1995). First (*condition 0*), if public transport services and tariffs were the same as at the survey time was carried out. Second (*condition 1*), if public transport services were better with shorter travel time, direct routes and normal tariffs. Then (*condition 2*), if public transport services were better with shorter travel time and direct routes, but the tariffs became 1.5 times as much as normal tariffs. Furthermore (*condition 3*), if public transport services were better with shorter travel time and direct routes, but the tariffs became 2 times as much as normal tariffs. Finally (*condition 4*), if public transport services were better with shorter travel time and direct routes, but the tariffs became 2.5 times as much as normal tariffs.

2.2. Study Area

Study area was limited by certain criteria as follows:

1. Study area was located at The National Residence of Simalingkar in Medan, since this was the biggest residential area in Medan. The residents also represented all economic levels of income in Medan compared to other residences. Moreover, all of the surveyors (8 people), who were from the third level of university students, were more familiar to this residence than others since they lived at this residential area.
2. The travel form was *home – base trip*, it means that the travel was from homes to work places and vice versa.
3. Not everyone who lived at Simalingkar had high accessibility to the available public transport. Therefore, chosen respondents were those who lived relatively close to public transport routes, which were about 500 meters.
4. The chosen respondents was 148 people from 148 households, who ranged from 15 to 65 age groups, from various levels of income and worked as either government officers or private officials. This study emphasized the procedure and process of obtaining and analysing data methods for the students.

2.3. The Aims of Research

The expected tendencies of this research were:

1. To find factors that affected transport mode preferences for work travel in the study area.
2. To compare the percentages of travellers who used either public transport or private vehicles based on certain factors, e.g.: gender, ages, income levels, certain kinds of job and policy changes of public transport systems in the study area.
3. To define the salient factor that influenced travellers in making their preferences on a kind of available transport modes, if there were varieties of policy of public transport systems assumed in the study area.

3. RESEARCH METHODOLOGY

3.1. Groups of Respondents

First, respondents in The National Residence of Simalingkar were distinguished into two groups, i.e.: private vehicle users and public transport users. Then public transport users were further distinguished into two other groups: males and females. However, private vehicles users were not necessarily separated because it was difficult to find a sufficient number of female respondents who use private vehicles in the residential area. Thus, respondents were classified into three groups:

1. Male public transport users
2. Female public transport users
3. Private vehicle users.

Among public transport users, there were choice travellers, who used public transport or private vehicles for certain reasons. In addition, there were also captive travellers, who were forced to use public transport because they had no private vehicles yet at that time (1999).

3.2. Groups of Income

Monthly levels of income of respondents were classified into 4 categories in accordance with the economic levels of residents at that time (1999) as the following below:

1. < Rp. 500,000.00
2. Rp. 500,000.00 – Rp. 1,000,000.00
3. Rp. 1,000,000.00 – Rp. 1,500,000.00
4. Rp. 1,500,000.00

3.3. Collecting Data

The required data were obtained through home-interview by using questionnaires and referred to stated preference techniques (Davidson and Louviere et. al, 1973). The data were obtained based on certain factors such as gender, ages, income levels, certain kinds of job and policy changes of public transport systems. Davidson and his colleagues claim that there will be differences between respondents' views from questionnaires based on suppositions or assumptions and the fact of how the respondents exactly behave. Questionnaires were conceptualised in such a way that respondents can choose one answer among available answers, can give specific answers and feel free to answer the questions (Blalock, 1968). The conclusions will be made of data interpretation from the survey results (observation) by using statistic descriptive method.

Eight surveyors have collected data from the study area for about 1-3 months since certain respondents also needed helps to correctly fill the questionnaires. The surveyors collected the data from 148 respondents including captive and choice travelers. Surveyors were trained to carry out the survey in study area through specific assignments, which have been determined together, in order to be not overlapping. Surveyors who have been chosen were from the third level university students who lived at the National Residence of Simalingkar, because it was expected that they would be familiar with the situation and condition in the study area.

3.3.1. Total Travel Time

Duration of total travel time from homes to work places generally varies every day. Therefore, the total amount of travel time is the mean value of travel time that a respondent experiences every day.

To reach shorter travel time, public transport drivers should not stop their vehicles too long to wait a sufficient number of passengers until the vehicles are full. The ideal condition can occur when the number of passengers is large enough from time to time. This will occur at morning (school-time and work-hour start), mid day (school-time end) and afternoon (work-hour end) peak hours. However, private vehicles also add traffic volume at that time, therefore ideal travel time is difficult to reach, because the traffic may not run smoothly.

3.3.2. Travel Cost

The amount of travel costs individually from homes to work places by using private vehicles is difficult to predict, because it is related to costs for instance: vehicle ownership, tax, fuel, maintenance and perhaps insurance. In addition, the vehicles may not only be used for

working but also for other needs, e.g. shopping and going out for lunch. Moreover, majority of travellers did not realize the costs related to vehicle ownership such as: the depreciation in selling price and maintenance of private vehicles. Therefore, the amount of travel costs may only be predicted roughly but logically based on respondents' perceptions. On the other hand, the amount of travel costs by using public transport is the total amount of tariffs that passengers have to pay according to prevailing tariffs.

4. DATA ANALYSIS

4.1. Distribution of Travellers Based on Gender

The collected data from the survey results were organized into table forms to be analyzed by specifying reasons for transport mode preferences, as the following below:

Table 1. Reasons for Transport Mode Preferences - Males

Modes	Safer		More Comfortable		Cheaper		Faster	
	Total	%	Total	%	Total	%	Total	%
P	18	17.0	22	20.8	3	2.8	63	59.4
U	1	4.2	2	8.3	20	83.3	1	4.2

Table 2. Reasons for Transport Mode Preferences - Females

Modes	Safer		More Comfortable		Cheaper		Faster	
	Total	%	Total	%	Total	%	Total	%
P	4	51.1	0	0	0	0	3	42.9
U	0	0	0	0	11	100	0	0

Table 3. Transport Mode Preferences – Gender

Modes	Males	Females	Males (%)	Females (%)
P	106	7	81,5	38,9
U	24	11	18,5	61,1
Total	130	18	100	100

Table 4. Transport Mode Preferences – Reasons

Reasons	P	U	P (%)	U (%)
Safer	22	1	14.9	0.7
More Comfortable	22	2	14.9	1.4
Cheaper	3	31	2.0	20.9
Faster	66	1	44.6	0.7

Note:

P mode is private vehicle mode

U mode is public transport mode

The numbers of respondents are 148 people.

From tables 1 – 4 above, it can be concluded that male respondents preferred private vehicles because travel could be faster, whereas female respondents chose private vehicles because travel could be safer e.g. from pickpockets. Travel time and safety factors determined the preferences of private vehicles. However, travellers still used public transport because the amount of travel costs was cheaper. From table 4 above, apparently both males and females respondents would choose using public transport due to the cheaper costs and they would choose using private vehicles because they can save travel time.

4.2. Distribution of Travellers Based on Ages

Distribution of travellers based on ages can be observed at table 5 below:

Table 5. Distribution of Travellers – Ages

No.	AGES	GROUPS		
		I	II	III
1	15 – 20	2	2	0
2	20 – 25	21	49	14
3	25 – 30	29	25	10
4	30 – 35	13	8	9
5	35 – 40	4	5	20
6	40 – 45	8	3	21
7	45 – 50	10	6	10
8	50 – 55	9	2	11
9	55 – 60	3	0	5
10	60 – 65	1	0	0
	TOTAL	100	100	100

Note:

Group I: Male of public transport users

Group II: Female of public transport users

Group III: Private vehicle users

From table 5 above, it can be observed that the largest numbers of public transport users at group I and II (males and females) were at the age groups of 20 – 25 and 25 – 30 years old respectively or at relatively young ages. However, the private vehicle users (group III) had the largest number at the age groups of 35 – 40 and 40 – 45 years old. This condition explains that majority of young ages had no private vehicles yet, having relatively low income or having short work durations, so that they tended to use public transport more than private vehicles.

Based on the age groups, the percentages of travellers who answered ‘Yes’ to the assumed conditions from the question: “If you are a private vehicle user, will you still use private vehicle at the assumed conditions of policy systems of public transport?” are shown in Table 6 below:

Table 6. Private Vehicle Mode Preferences - Ages

No.	AGES	C			O			N			D			I			T			I			O			N			S								
		0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4						
		GROUPS																																			
		I			II			III			I			II			III			I			II			III			I			II			III		
1	15 – 20	1	2	0	2	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0						
2	20 – 25	13	43	0	17	46	1.92	15	41	0	15	34	0	13	32	0	13	32	0	13	32	0	13	32	0	13	32	0	13	32	0						
3	25 – 30	25	21	0	28	25	0.96	23	21	0	23	20	0	21	18	0	21	18	0	21	18	0	21	18	0	21	18	0	21	18	0						
4	30 – 35	11	7	0	12	8	1.92	7	8	0.96	7	7	0.96	5	7	0.96	5	7	0.96	5	7	0.96	5	7	0.96	5	7	0.96	5	7	0.96						
5	35 – 40	4	5	0	4	5	5.77	4	4	0.96	3	4	0	3	4	0	3	4	0	3	4	0	3	4	0	3	4	0	3	4	0						
6	40 – 45	7	3	0	8	3	3.85	8	2	2.88	8	2	0.96	7	2	0.96	7	2	0.96	7	2	0.96	7	2	0.96	7	2	0.96	7	2	0.96						
7	45 – 50	8	5	0	9	6	2.55	8	5	1.92	7	4	1.92	6	4	1.92	6	4	1.92	6	4	1.92	6	4	1.92	6	4	1.92	6	4	1.92						
8	50 – 55	9	2	0	9	2	0.96	9	2	0	8	2	0	7	2	0	7	2	0	7	2	0	7	2	0	7	2	0	7	2	0						
9	55 – 60	3	0	0	3	0	2.88	2	0	0.96	2	0	0.96	2	0	0.96	2	0	0.96	2	0	0.96	2	0	0.96	2	0	0.96	2	0	0.96						
10	60 – 65	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0						
Total		82	88	0	93	97	21.15	78	85	7.69	75	75	4.81	66	71	4.81	66	71	4.81	66	71	4.81	66	71	4.81	66	71	4.81	66	71	4.81						

Note:

Group I: Male of public transport users

Group II: Female of public transport users

Group III: Private vehicle users

Assumptions:

Conditions 0 until 4 were conditions if all respondents were supposed to have and able to drive private vehicles by themselves.

Condition 0: if public transport services and tariffs were the same as at the survey time was carried out.

Condition 1: if public transport services were better with shorter travel time, direct routes and normal tariffs.

Condition 2: if public transport services were better with shorter travel time and direct routes, but the tariffs became 1.5 times as much as normal tariffs.

Condition 3: if public transport services were better with shorter travel time and direct routes, but the tariffs became 2 times as much as normal tariffs.

Condition 4: if public transport services were better with shorter travel time and direct routes, but the tariffs became 2.5 times as much as normal tariffs.

From the table 6 above, apparently the policy changes of public transport systems may have the same effect for all age groups, except for group III (private vehicle users) especially at condition 3 and 4. Group III will still use public transport even at conditions 3 and 4. Therefore, the most important factor for work travel for group III is *shorter travel time*, no matter how much the tariff is. However, in general all the age groups would not consider using public transport at condition 3 and 4.

In addition, from the both table 5 and 6, it is interesting to observe that no old female respondents between 55 until 65 years old preferred to use public transport. This evidence supported results in Table 1 – 4 showing that female respondents prioritized safety factor in selecting transport modes.

4.3. Factor of Policy Changes of Transportation Systems

Percentages of travellers who answered ‘Yes’ to the assumed conditions from the question: “If you are a private vehicle user, will you still use private vehicle at the assumed conditions of policy systems of public transport?” are shown in Table 7 below:

Table 7. Private Vehicle Mode Preferences

CONDITIONS	0	1	2	3	4
Group I	19	6	21	24	30
Group II	21	4	16	26	33
Group III	100	77	91	94	92

Note:

Group I: Male of public transport users

Group II: Female of public transport users

Group III: Private vehicle users

Assumptions:

Conditions 0 until 4: refer to assumptions in Table 6.

From table 7 above, it could be predicted that by improving public transport services thoroughly, apparently there were a significant decrease of private vehicle users especially at condition 1. However, the number of private vehicle users would be back to the beginning at condition 2, 3 and 4. It means that quality improvement of public transport services with higher tariffs may not be successful in 1999/2000 economic conditions. Public transport was still not attractive to choice travellers. Nevertheless, certain travellers may consider deeply between risks of using private vehicles and public transport from accidents, so that they might be ready to change using private vehicles into public transport. This condition will occur especially when there is a particular policy in public transport systems such as condition 1. Furthermore, it needs a deeper and wider explanation to travellers.

4.4. Factor of Income Levels

The relationship between income levels and transport mode preferences is shown at table 8 at the following below:

Table 8. Transport Mode Preferences - Income Levels

LEVELS OF INCOME	MODES	CONDITIONS											
		0 (%)		1 (%)		2 (%)		3 (%)		4 (%)			
		GROUPS											
		I	II	I	II	I	II	I	II	I	II		
I	A	18	46	7	37	21	37	22	44	28	44		
	B	61	0	72	8	58	8	57	2	51	2		
II	A	0	50	0	38	1	38	3	48	6	48		
	B	19	0	19	11	18	11	16	2	13	2		
III	A	0	4	0	2	0	2	0	3	0	3		
	B	1	0	1	1	1	1	1	1	1	1		
IV	A	0	0	0	0	0	0	0	0	0	0		
	B	0	0	1	0	1	0	1	0	1	0		
TOTAL		100	100	100	100	100	100	100	100	100	100		

Note:

Level of income I < Rp 500.000

Level of income II: Rp 500.000 – Rp 1.000.000

Level of income III: Rp 1.000.000 – Rp 1.500.000

Level of income IV > Rp 1.500.000

Group I: Male of public transport users

Group II: Female of public transport users

Mode A: Private Vehicle

Mode B: Public Transport

Assumptions:

Conditions 0 until 4: refer to assumptions in Table 6.

From the table 8, the majority of public transport mode users were the travellers who had income less than Rp. 500,000.00 monthly. This will be a very useful indication for decision-maker of public transport systems to consider this group of income in organising public transport systems.

4.5. Factor of Certain Kinds of Job

Transport mode preferences for work travel can be influenced by kinds of jobs. This study selected government officers and private officials types of jobs since both types receive regular main salary every month. The percentages of travellers who answered 'Yes' to the question: "Will you still/ change to use public transport at the assumed conditions below?" are shown in table 5 as follows:

Table 9. Transport Mode Preferences – Kinds of Jobs

CONDITIONS	0 (%)			1 (%)			2 (%)			3 (%)			4 (%)			
	GROUPS															
		I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Civil Servants	86	88	0	97	100	26	86	92	9	42	56	7	38	44	7	
Private Officials	80	88	0	91	96	16	74	87	6	72	72	2	65	68	2	

Note:

Group I: Male of public transport users

Group II: Female of public transport users

Group III: Private vehicle users

Assumptions:

Conditions 0 until 4: refer to assumptions in Table 6.

In Indonesia, private officials generally have much better income than civil servants although however civil servants have more secured jobs. Therefore, from table 9 above it can be observed that majority of private officials tended to use private vehicles except at condition 1, whereas civil servants tended to use public transport. It is interesting to observe that it was only 40% to 50% of civil servants still tried to use public transport at condition 3 and 4 due to having no private vehicles yet.

5. CONCLUSION

The study on transport mode preferences has been undertaken in one of residential areas in Medan (North Sumatra Province of Indonesia) by using questionnaires and home interview. This study aimed at emphasizing the procedure and the process of obtaining and analyzing data for the third level of students at University of Sumatra Utara Medan. The following is a brief summary of findings:

- Factors that can influence transport mode preferences for work travel in Medan especially in the residential area were based on gender, ages, income levels, kinds of job, policy systems of public transport, travel time and travel cost.
- Apparently the quality improvement of public transport services with higher tariffs (ranged from 1.5 - 2.5 times as much as normal tariff) would not be successful and not attractive to choice travellers in Medan especially for residents in the study area.
- Travel time (faster) and safety factors determined the preference of private vehicle, whereas travel costs (cheaper) determined the preference of public transport.
- Based on the age groups, the majority of public transport users were at the age groups of 20 to 30 years old (young ages) due to having no private vehicles yet, having relatively low income and having short work durations. However, the majority of private vehicle users were at the age groups of 35 to 45 years old.
- Based on income levels, the majority of public transport users were those who have relatively low income (below Rp. 500.000,00). Therefore, increasing the fuel prices, which will also increasing the public transport tariffs, can affect political situations in Indonesia.
- Based on types of job, majority of private officials tended to use private vehicles due to having much better income than civil servants except there was an improvement in public transport services with reasonable tariffs.

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