

Commuters' Behaviors and Attitudes toward Current Transport Mode Chosen

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Abstract

The paper provides overview of the commuters' behaviors and attitudes towards current transport modes used and what are the factors influences of the motorization trends within the last six years. By using the National Socio-economic Survey (NSS) and National Labor Force Survey (NLFS) as well as the primary data collected to know the private vehicles' attitudes, it is found that the distance of commuters is getting far and they prefer to use private vehicles to commute, especially motorcycles that are faster and the cost is also reasonable. Based on the income level, it shows very clear evidence that higher income groups mostly use cars, and it is different from motorcycles that are used for all income levels. As a consequence, the share of public transports has been decreasing although government has been trying to improve the capacities and services of some public transports.

Key words: behaviors, attitudes, transport mode choice

1. Introduction

Jakarta as the capital city of the Republic of Indonesia is also the center of economic activities in Indonesia. As the biggest city in Indonesia, the urbanization has progressed rapidly. Due to this condition, the Jakarta area has been expanded beyond its original area, and it is integrated with surrounded cities, namely Bogor, Depok, Tangerang, and Bekasi. These four cities have a function to be the buffer areas of Jakarta. The integration of Jakarta with other cities is called JaBoDeTaBek (Jakarta Bogor Depok Tangerang Bekasi).

As the metropolitan areas, the growing of vehicles is very high especially the private vehicles. The growth rates during the last ten years from 2006 to 2012 are 6.9% and 12.6% for cars and motorcycles respectively (Statistics Indonesia, 2014). Moreover, in Jakarta, a number of households having a car are approximately about 20.7% and the average number of car owning per household is about 1.2 which is same or little bit higher than developed countries (Susilo et al, 2007). The high growth rate is only happened to the number of motorcycles. However, the high growth rate of motorcycles does not only happen in Indonesia, but also in some developing Asian countries such as China, Thailand, Malaysia, Taiwan and Vietnam because probably motorcycles have been considered as a temporary mode (Tuan and Shimizu, 2005).

The effects of high increase of vehicles are congestion, air pollution, greenhouse gas emissions, and traffic accident as well. Unfortunately, in Jakarta recently private vehicles become mainstay due to inadequate of public transportation. At present, the modal share of public transportation is about 22% and will increase about 27% in 2030 with the assumption by improving public transportation services (JUTPI, 2012). Encouraging people to use public transportation will give positive effects to be more efficient in term of energy consumption and less pollution and it will enhance the quality of life in cities and regions (Xiaojun Hu et.al, 2010).

As a consequence, it is reasonable and common that most of the people depend on the private vehicles, for daily commuting. It is because by driving cars, it can give people autonomy since it is more convenient, reliable and increase their accessibility (Hiscock, et al., 2002). Other reasons for driving cars are it will get physiological benefits such as mastery, self-esteem, feelings of autonomy, protection, and prestige (Ellaway et al., 2003). The evidence from Hong Kong why people depend on the cars is after having a car it will change their lifestyle, and a car becomes necessary (Cullinane and Cullinane, 2003).

To reduce travel by private vehicles is an urgent problem since Jakarta has been nominated to be one of the congested cities in the world. Current policies of urban transportation in Indonesia will focus on sustainability on social, economic, and environmental. Safe, clean and energy-efficient transport is the vision in order to achieve green growth and energy security (Ministry of Transportation and Directorate Urban Transport System 2012). Improving public transportation services both in capacity and quality are implementing transit-oriented-development (TOD), developing transport networks and constructing infrastructure for mass transportation, improving inter-modalities and public transport accessibility, and improving the public transport system ownership. Management and manipulation of traffic are also needed to improve the road capacity by implementing Adaptive Technology Computing Services (ATCS) and Intelligent Transportation System (ITS), traffic management, and analysis of traffic impacts. However, the policy measures must be effective, feasible and acceptable to the public. Coercive measures such as prohibition of car traffic, 3 in 1 system, which is the only cars with three passengers or more passengers, can enter the central business area in Jakarta during the peak hours, morning and after office hours. The other policy implemented is not allowing on-street parking. Moreover, the government is also improving the provision of public transport namely Bus Rapid Transit (BRT), revamp the Jabodetabek Railway but the capacity and the level of services cannot meet the demand. As the consequence, the growing of private vehicles is still high, and the congestion is getting worse.

It is needed to get the commuters' characteristics in term of socio-demography, behaviors and attitudes as a basis to choose the best policy that should be implemented to attract people to shift to use public transportation. The objectives of this paper are: first assigns the commuters' profiles, second identifies the determinants of current commuters' behaviors in transport mode decisions and third describes the attitudes of commuters, especially private vehicle users either car or motorcycle users. By knowing the commuter profiles, behaviors, and attitudes, it can be used as a basis to deliver appropriate policies that can encourage people to use public transport.

2. Research Method

2.1 Data

This study uses secondary data obtained from Statistics Indonesia, the National Socio-economic Survey (NSS) and the National Labor Force Survey (NLFS) within the last 6 years, from 2009 to 2014, to get the commuters profiling and behaviors. NSS, known as SUSENAS, is a survey conducted by BPS-Statistics Indonesia every year to collect information and data for some fields, such as population, health, education, family planning, housing, as well as consumptions and expenditure. Since 2011, this survey is carried out quarterly, visiting about 75,000 households per quarter. It selects the households as sampling unit that is annually representing total Indonesia population. The respondent covered by this survey is all members of the selected households. The designed questionnaire consist of two parts, namely core and modules. There are three different modules, such as module of household consumption and expenditure, a module of social, culture and education, a module of housing and health. The module is rotated every year, meaning that each module is being questioned every three-year (BPS 2014b).

NLFS, known as SAKERNAS, is another survey managed by BPS-Statistics Indonesia and conducted by every quarter to record data that describe general figures of labor force and employment continuously. Annually it covers 200,000 households, distributed into 20,000 census-blocks in all provinces. Total samples from this survey are about 5,000 census-blocks per quarter, selected by probability sampling. However for the third quarter on August, it boosts the total sample up to 20,000 census-blocks, including 5,000 basic census-blocks and additional 15,000 census-blocks, to get figure estimation fit for the level of municipality/city. This survey targets to all members of selected households, who age equal or greater than ten year-old, as the respondent to be questioned regarding marital status, education, employment, and working experience. Since 2011, it has utilized panel sampling. Therefore the parameters of labor force and employment can be compared directly with one period to another period (BPS 2014a).

In addition, to know the attitudes of commuters, it is used primary data, which are obtained from the survey to commuters who are using private vehicles, cars and motorcycles, for daily commuting and mainly they are working in the CBD of Jakarta. It is asked about the reasons why respondents have and use private vehicles for daily commuting, the necessity of private vehicles, and the factors deterrence from driving cars or motorcycles. Due to the data collected by using questionnaire, the validity and reliability of questionnaires has been checked, and it shows that the questionnaires are valid and reliable. Among the main variables concerned are correlated and significant at 1%, and the value of Cronbach Alpha is 0.909.

2.2 Multinomial Logit Model

The multinomial logit is the extension of the logit model. In the multinomial logit, it is assumed that the log-odds of each response follow a linear model:

$$\log \frac{P_{ij}}{P_{i1}} = \alpha_j + \beta_j X_i, \text{ where } \alpha_i \text{ is a constant and } \beta_j \text{ is a vector of regression coefficients, for } j = 1, 2, \dots, j-1.$$

The subscript i , designating individual observations, has been dropped for simplicity. In this case $P_j, j = 1, \dots, j-1$ indicates the probability that the j th choice will be made. Each equation assumes that the logarithm of the odds of one choice relative to a second choice is a linear function of the attribute X . These odds are dependent on the odds associated with the remaining two equations only in the sense that the system must be constrained so that the sum of the individual probabilities equal to 1. It is unnecessary to estimate each of the three equations separately. We can simplify by accounting for the fact that the choice of logit form forces constraints on the model that reduce the number of parameters to be estimated.

The estimated parameters will determine the effect of changes in X on the logarithm of the ratios of the probabilities. If actual magnitudes are needed, one must take into account the constraint that the estimated probabilities sum to 1. This can be done by renormalizing the estimated parameter value after the initial least squares regression has been run. However, the errors are likely to be heteroscedastic. In addition, the cross-equation error correlation ought to be accounted for by using generalized least squares.

If sufficient repetitions are not available a generalized version of the maximum-likelihood procedure must be used, because it guarantees consistent parameter estimates and correct large-sample statistics (Pindyck, 1998).

2.3 Chi-square Test

In analyzing the data, it is used descriptive analysis such as frequency, percentage, mean and indexing analysis. For the indexing analysis, it is tested by Chi-square test to know is there any statistically significant differences or not. Chi-square test is symbolized by χ^2 it is useful for categorical data to test the association between row and column variables in a two-way variables. The null hypothesis H_0 for this method is no association between variables and the alternative hypothesis H_a is that some association exist. By χ^2 it is only to know the association but could not know what type of association among variables. χ^2 test in is computed as

$$\chi^2 = \sum \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

The statistic distribution of χ^2 is chi-square with $(r-1)(c-1)$ degrees of freedom, where r represents the number of rows in the two-way table and c represents the number of columns. From the equation, i and j index the rows and columns of the table. The distribution is denoted by df called degrees of freedom and is defined for all positive values. The p -value for the chi-square test is the probability of observing a value at least as extreme as the test statistic for a *chi-square* distribution with $(r-1)(c-1)$ degrees of freedom (J. Cohen, 1977).

3. Results and Discussion

3.1. Jakarta's Commuters Profiling

The profiles of respondents covered in this study that are related to the transport behavior chosen can be described based on the gender, education, and monthly income. From the data, it shows that the numbers of male and female commuters are significant different, where the male is much higher than female within the last six years. Most of the commuters have age between 25-year-old and less than 45-year-old. Meaning that, they are still in the productive ages. It is evidence of high urbanization, and most of them are people in the productive ages. However, the education level of commuters mostly is the senior high school, but within six years, the numbers of commuters who have at least undergraduate level are increasing. It is inlined also with the income of commuters which is increasing about 60% in 6 years. The higher the education level, the higher the income that the commuters get. Figure 1, Figure 2, Figure 3, Figure 4 are described the commuters' profile of gender, age, education and income.

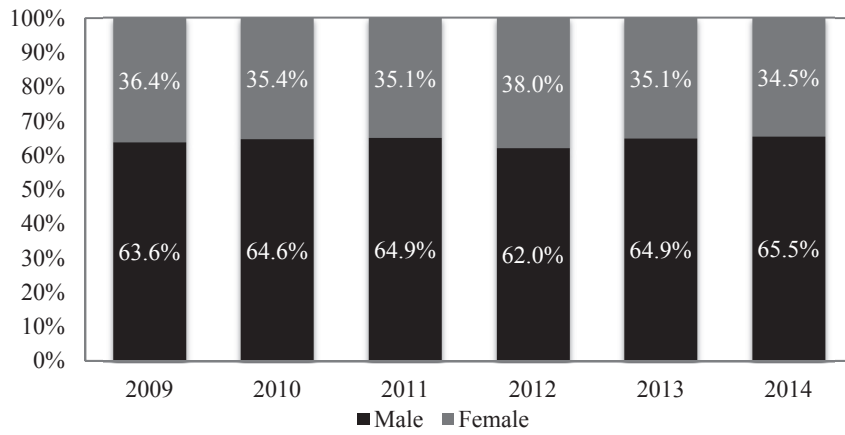


Figure 1. Gender of Cummuters

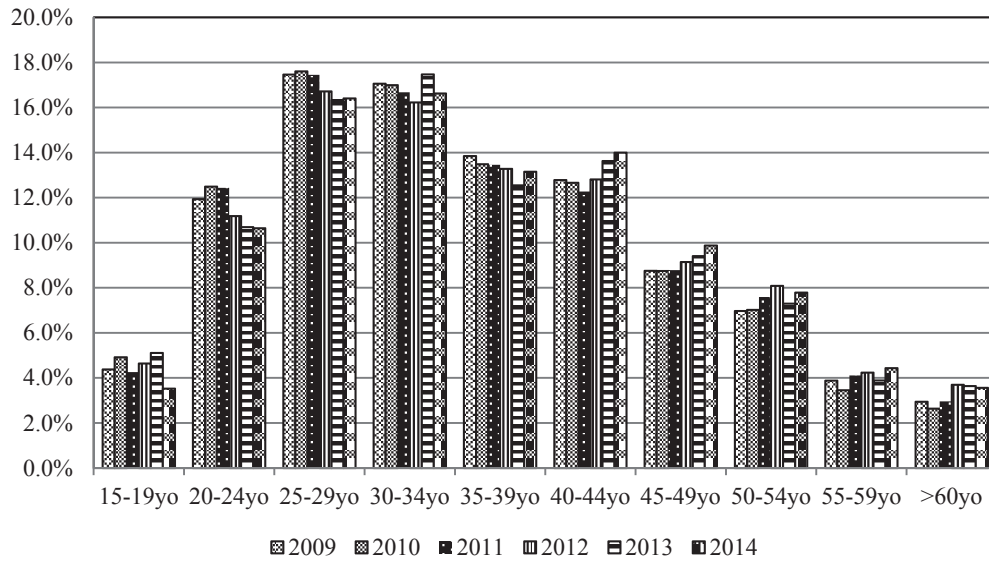


Figure 2. Age of Cummuters

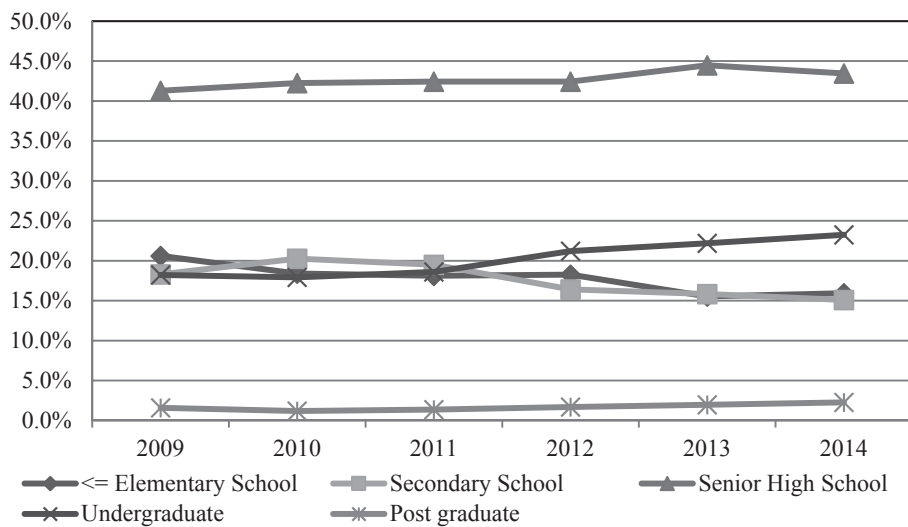


Figure 3. Education Level of Commuters

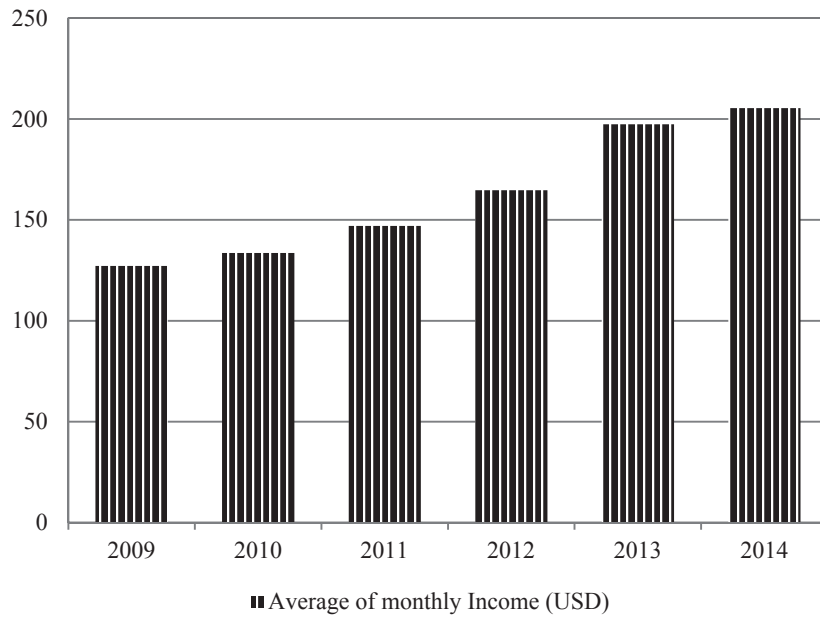


Figure 4. Average of Monthly Income of Commuters

3.2. Commuters' Behavior toward Transport Mode Chosen

The travel distance of commuters during six years is getting farther, especially within the range 10-29 km. There are some possibilities: the commuters cannot get any houses inside of Jakarta areas because of already full, or they are not be able to buy houses in the middle of Jakarta areas. And also the urbanization is still high, the buffer areas of Jakarta, BoDeTaBek becomes the targets to get houses. This is very common in the metropolitan areas where they are working in the middle of the city and living outside of the city. Figure 5 shows the travel distances of commuters in the last six years.

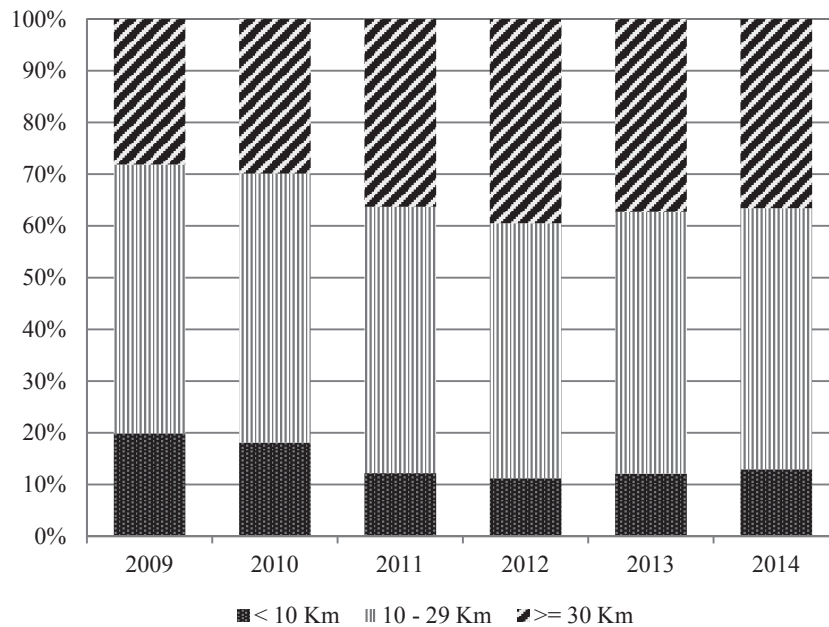


Figure 5. Change in Travel Distance of Commuters form 2009 to 2014

From the Figure 6, it is described that the travel distance of commuters is increasing and it is proven from the city origin of commuters from BoDeTaBek is also increasing, where the number of commuters who are living in Jakarta is not changed significantly.

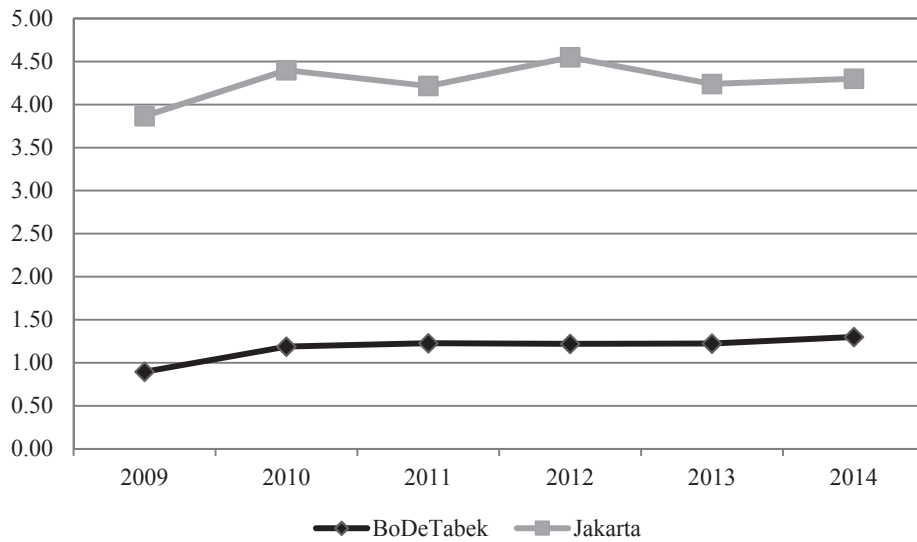


Figure 6. The City Origin of Commuters

The share of female commuters chooses non-motorized and public transport is quite high compared to the motorcycle and car. Especially for motorcycle users, most of them are male. Figure 7 describes the share of male and female regarding the transport mode chosen.

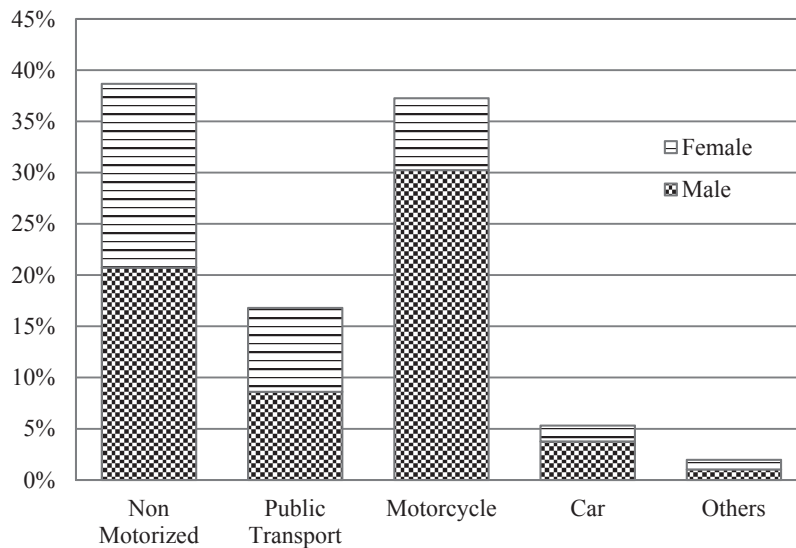


Figure 7. The Modal Share based on Commuters' Gender 2013

Grouping the transport mode choice based on the income level describes very clear evidence that commuters who are using cars are mostly high-income level. The public transports mostly are used by the low-income group. Interestingly, the motorcycles are preferred by people with all the range incomes. Even the high-income people, they still prefer to choose motorcycle for their commuting. For the lowest income group, the non-motorized share is very high. It implies that even the public transport is not affordable. If it is compared to the share of motorcycle and public transport, motorcycle share is always higher in all ranges of income groups. In total, the share of public transport is very small.

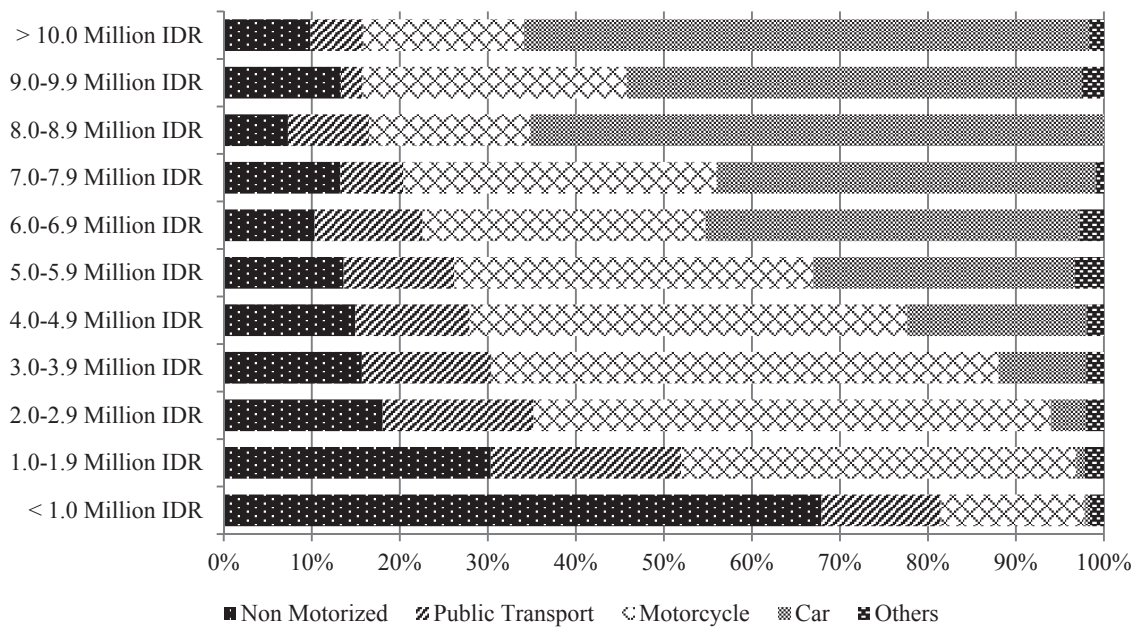


Figure 8. Modal Share by Commuters' Income 2013

If it is compared the modal share in 2011 and 2013, although within two years, it can be seen that the share of public transport is going down by 3%, and the share of motorcycles is increasing by 5%. In general, the share of private vehicles has increased.

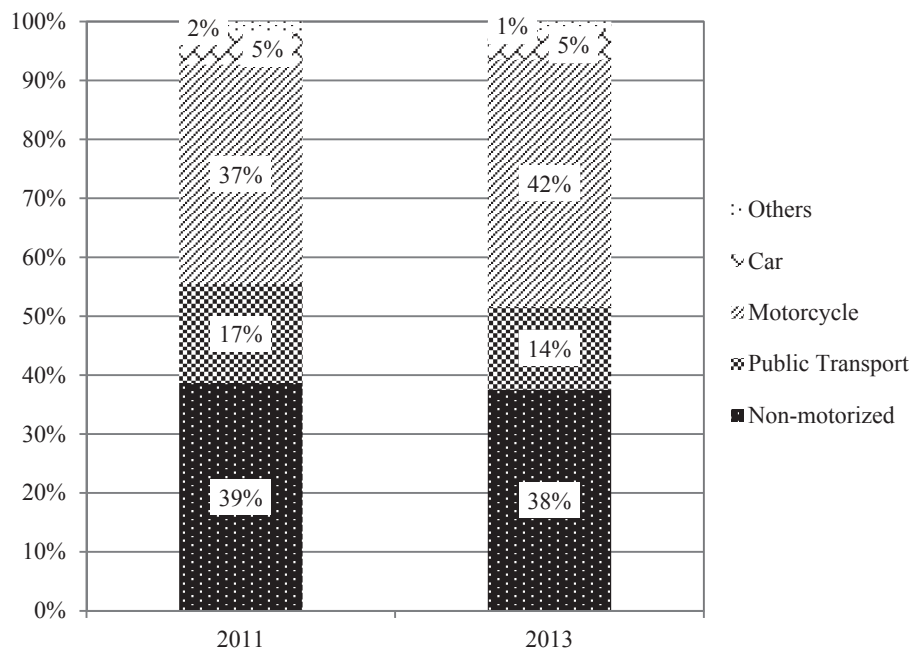


Figure 9. Change of Modal Share between 2011 and 2013

Based on the education level of commuters, it is interesting because the share of public transport for commuters who has a university degree is also high. It is also similar to the share of the motorcycle that is still high. Moreover, it is clearly proven that most of the car users are come from the commuters who have a university degree. Another important thing is the share of non-motorized for a university degree is quite big because recently there is a trend that commuters prefer to ride their bicycles to work in Jakarta. They have a community that is called by "Bike to work." Figure 10 shows the modal share based on the education level of commuters.

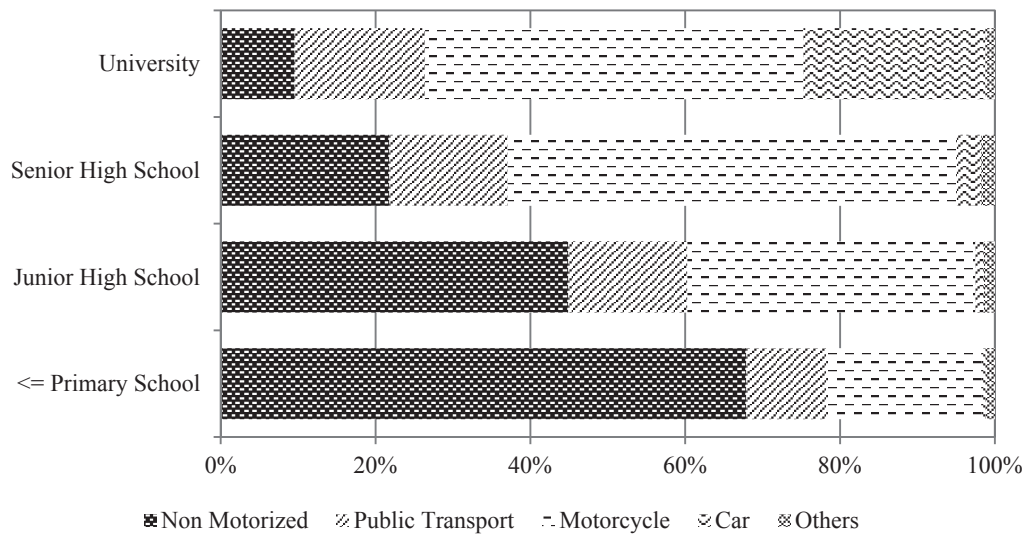


Figure 10. Modal Share by Commuters' Education Level

Based on the NSS data, it is also can estimate the work travel demand of commuters by using multinomial logit where the dependent variable is the transport mode chosen. The model fitted information shows the Chi-square test is significant at 1% and all the independent variables used are also significant at 1%. It represents that the ratio of transport cost to expenditure affects the transport mode choice. Other variables, such as education, occupation and the city of living, also influence the current transport mode choice. Pseudo R-Square is also high, which is more than 0.2 for the Cox and Snell and also Nagelkerke.

Table 1. Likelihood Ratio Tests

Effect	Likelihood Ratio Tests			
	Model Fitting Criteria		Likelihood Ratio Tests	
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	7944.078 ^a	0.000	0	
transport cost/expenditure	8005.993	61.916	4	.000
Education	8788.250	844.173	4	.000
Occupation	8008.959	64.882	12	.000
City of living	7984.346	40.269	16	.001

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Table 2. Pseudo R-Square

Pseudo R-Square	
Cox and Snell	.264
Nagelkerke	.286
McFadden	.118

Table 3 described the parameter estimates of the multinomial logit model for all transport modes chosen.

Table 3. Parameter Estimates of Multinomial Logit Model

transport chosen		Parameter Estimates					95% Confidence Interval for Exp(B)		
		B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound
Car	Intercept	-8.297	.826	100.862	1	.000			
	transport cost/expenditure	1.199	.623	3.704	1	.054	3.317	.978	11.248
	Education	.500	.032	243.974	1	.000	1.649	1.549	1.756
	Worker	1.585	.688	5.312	1	.021	4.877	1.267	18.765
	Student	-16.549	8021.924	.000	1	.998	6.498E-08	0.000	. ^b
	Housekeeper	1.823	1.158	2.477	1	.115	6.189	.640	59.899
	Otherwise	based							
	South Jakarta	-.274	.270	1.031	1	.310	.760	.447	1.291
	East Jakarta	-.101	.256	.156	1	.693	.904	.547	1.493
	Central Jakarta	-.541	.287	3.545	1	.060	.582	.331	1.022
	West Jakarta	.464	.264	3.088	1	.079	1.590	.948	2.667
	North Jakarta	based							
Motorcycle	Intercept	-.397	.402	.979	1	.322			
	transport cost/expenditure	-.320	.501	.407	1	.523	.726	.272	1.939
	Education	.051	.017	9.311	1	.002	1.053	1.019	1.088
	Worker	1.200	.352	11.602	1	.001	3.319	1.664	6.620
	Student	-.375	1.459	.066	1	.797	.687	.039	11.984
	Housekeeper	.646	.773	.697	1	.404	1.908	.419	8.687
	Otherwise	based							
	South Jakarta	.092	.181	.259	1	.611	1.096	.770	1.561
	East Jakarta	.118	.170	.477	1	.490	1.125	.806	1.570
	Central Jakarta	-.428	.188	5.203	1	.023	.652	.451	.942
	West Jakarta	.328	.181	3.285	1	.070	1.388	.974	1.978
	North Jakarta	based							
Bicycle	Intercept	-.256	.703	.133	1	.716			
	transport cost/expenditure	-.228	.933	.060	1	.807	.796	.128	4.950
	Education	-.130	.027	24.152	1	.000	.878	.833	.925
	Worker	.452	.646	.490	1	.484	1.572	.443	5.574
	Student	-16.866	0.000		1		4.731E-08	4.731E-08	4.731E-08
	Housekeeper	1.063	1.116	.908	1	.341	2.895	.325	25.798
	Otherwise	based							
	South Jakarta	.077	.316	.060	1	.807	1.080	.581	2.008
	East Jakarta	-.221	.318	.484	1	.487	.802	.430	1.495
	Central Jakarta	-.276	.341	.655	1	.418	.759	.389	1.481
	West Jakarta	-.052	.320	.027	1	.870	.949	.507	1.777
	North Jakarta	based							
Walking	Intercept	2.579	.376	47.073	1	.000			
	transport cost/expenditure	-4.649	.817	32.355	1	.000	.010	.002	.047
	Education	-.154	.017	84.269	1	.000	.857	.830	.886
	Worker	.214	.327	.428	1	.513	1.238	.653	2.348
	Student	-16.931	4174.889	.000	1	.997	4.436E-08	0.000	. ^b
	Housekeeper	1.890	.682	7.673	1	.006	6.618	1.738	25.200
	Otherwise	based							
	South Jakarta	.163	.189	.738	1	.390	1.177	.812	1.705
	East Jakarta	-.026	.181	.020	1	.888	.975	.683	1.391
	Central Jakarta	.028	.192	.022	1	.883	1.029	.706	1.499
	West Jakarta	.251	.189	1.768	1	.184	1.286	.888	1.862
	North Jakarta	based							

a. The reference category is: Public Transport.

b. The floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

c. This parameter is set to zero because it is redundant.

Based on the parameter estimates, where public transport chosen as the reference category, the model confirms that the commuters who travel using cars have significantly higher costs compared to use public transport. The education of car commuters is also higher than the education of public transport users. In term of the occupation, only workers have the significant different from public transport users. The other types of occupations are not significant different. Interestingly, the commuters who live in the West Jakarta prefer to use cars to commute, and the commuters who live in the Central Jakarta less prefer to use cars. It is because most of the business areas as well as the government offices are located in the Central Jakarta. Meaning that, their distance is not so far and no need to use cars to commute. The results of this parameter estimation for car users are not big different from the motorcycle users. The difference is only on the travel cost ratio to the expenditure, where for motorcycle users it is not significant different compared to the public transport users. For the non-motorized commuters that are using bicycles and walking, almost all variables are not significant different from the public transport users. The different significant variables are only education and transport cost which is lower than the public transport. However, for commuters who are walking, most of them are housekeepers, and this is significant different from public transport users.

3.3 Private Vehicle Users' Attitudes

To know the commuters' attitudes toward current transport mode chosen, it will analyze specifically for the private vehicle users, since it is important to know what are the factors that can discourage them in using private vehicles. Table 4 shows that the main reasons why people are owning car prefer to use it for daily commuting are being more comfortable, more flexible and more helpful for carrying things. The first reason is also supported by the second reason that is flexibility. In the people mindset by using public transportation, it is difficult to change the transportation modes to reach their destination. Some people try to find out the easiest and fastest way by using taxi motorcycle, called by "ojek" in Indonesia. Although these taxi motorcycles are non-formal public transportation due to no rules to regulate it, people prefer to use it with all the risks.

Table 4. The Three Main Reasons Why Respondents Have and Use A Car for Daily Commuting

Reasons	Importance ranking			Total	Weight score ^a	Rank of weighted score
	1 st	2 nd	3 rd			
Don't like public transport	7	4	9	20	38	8
Helpful for carrying things	22	20	22	64	128	3
Take children to school and other activities	11	16	12	39	77	6
Public transport not available	0	1	1	2	3	10
Improves status	5	14	20	39	63	7
Flexibility	22	43	46	111	198	2
More comfortable	78	48	30	156	360	1
Saves time	22	12	16	50	106	4
Just a habit	11	18	23	52	92	5
Disability in household	0	0	0	0	0	11
Company car	2	4	1	7	15	9

^a Weighted scores are calculated by multiplying 1st rank by 3, 2nd rank by 2 and 3rd rank by 1.

Another reason such as "Just a habit" is still in high rank that is rank fifth. Although car owners in Jakarta can access public transportation easily, indicating by a close distance of their home to nearest public transportation in average about 0.326 kilometers, they prefer to use a car than public transportation. Moreover, the public transportation system is not well developed, and it can be seen mainly no regular schedule, especially for para-transit and bus that are operated by the city. Due to this uncertainty and low in security and safety, people prefer to use private vehicles.

Table 5 shows the list of reasons why people want to have and use motorcycles including the rank of each reason. The first main reason is by using motorcycles it can save the time. Then, the second and third main reasons are following to the reasons for the car users, which are being more comfortable and giving more flexibility. That is true by using motorcycles it can be faster to reach the destination because the traffic congestion in Jakarta becomes worse recently. The fact that motorcycles are the fastest way to commute is supported by the data that the average speed for motorcycles is 33 kilometers per hour, where the average speed of cars and bus is 21 kilometers per hour and 17 kilometers per hour respectively (R. Suryo et al. 2007).

Table 5. The Three Main Reasons Why Respondents Have and Use A Motorcycle for Daily Commuting

Reasons	Importance ranking			Total	Weight Score ^b	Rank of weighted score
	1 st	2 nd	3 rd			
Don't like public transport	7	9	12	28	51	6
Helpful for carrying things	5	5	9	19	34	8
Take children to school and other activities	15	9	10	34	73	5
Public transport not available	1	1	2	4	7	10
Improves status	3	3	6	12	21	9
Flexibility	19	35	40	94	167	3
More comfortable	12	50	33	95	169	2
Saves time	104	36	23	163	407	1
Just a habit	7	27	37	71	112	4
Disability in HH	7	5	8	20	39	7
Company motorcycle	7	9	12	0	0	11

^bWeighted scores are calculated by multiplying 1st rank by 3, 2nd rank by 2 and 3rd rank by 1.

With the targeted respondents are people who use cars and motorcycles for daily commuting, it means at least they have one of those private vehicles. From the data, it shows that 63.3% of respondents have at least one car and some, 8.1% respondents, have more than one car. Respondent perception of the necessity of having a car is that 64.4% said totally necessary, and 35.0% said quite necessary. This number is higher than the respondent perception in Hong Kong which is 38% and 46% for totally necessary and quite necessary respectively (Cullinane and Cullinane, 2003). However, if it is compared to the result from a household survey in UK conducted in 1990, it is slightly lower. They found that the necessity of cars in UK was about 69% (Cullinane, 1992).

Table 6 exposes that there is a relationship between the necessities of having cars and length of ownership. It says the longer in having a car, the more necessary and it is signed by the highest percentage of respondents who have a car more than five years. The highest percentage, 79%, of totally necessary is the respondents who have a car between 6 to 10 years.

Table 6. Necessity of Car by Length of Ownership

	<=5 years	6-10 years	>=11years	Total
Totally necessary	52 (59)	33 (79)	31 (62)	116 (64)
Quite necessary	35 (40)	9 (21)	19 (38)	63 (35)
Not very necessary	1 (1)	0 (0)	0 (0)	1 (1)
Total	88 (100)	42 (100)	50 (100)	180 (100)

$\chi^2 = 17.105$, $df = 4$, $p = 0.002$, number in parantheses is the percentage

The Chi-square test is to see the significance of the relationship between the level of necessity and other variables. The necessity of the car is associated significantly with the length of ownership. This result is different with in Hong Kong study, where the level of perceived necessity is correlated significantly with annual mileage besides the length of ownership.

In addition, the necessity of the car is also related to the respondent occupation that is shown in table 7 and monthly household income as explained in Table 8. Respondents who work as a business person or self-employed considered cars are totally necessary, 80% than respondents who work as public servant or part time job. Moreover, respondents who work as part-time job mentioned that cars are quite necessary, 76%. The higher their income, the more necessary to have a car, if it is compared with group income, 74% respondents with income <7.9 million rupiahs said having a car is totally necessary, as well as the group with income more than 12 million rupiahs.

Table 7. Necessity of Car by Respondent Occupation

	Business person or self-employed	Public servant or organization staff	Part-time job	Student	Others	Total
Totally necessary	28 (80)	67 (66)	5 (24)	13 (68)	3 (75)	116 (64)
Quite necessary	7 (20)	33 (33)	16 (76)	6 (32)	1 (25)	63 (35)
Not very necessary	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	1 (1)
Total	35 (100)	100 (100)	21 (100)	19 (100)	4 (100)	180 (100)

$\chi^2 = 20.413$, $df = 8$, $p = 0.009$, number in parantheses is the percentage

Table 8. Necessity of car by monthly household income (million rupiahs)

	<7.9	7.0 – 8.9	9 – 11.9	>=12	Total
Totally necessary	25 (74)	31 (69)	19 (41)	41 (74)	116 (64)
Quite necessary	9 (26)	13 (29)	27 (59)	14 (26)	63 (35)
Not very necessary	0 (0)	1 (2)	0 (0)	0 (0)	1 (1)
Total	34 (100)	45 (100)	46 (100)	55 (100)	180 (100)

$\chi^2 = 18.264$, $df = 6$, $p = 0.006$, number in parantheses is the percentage

Results of testing the relationship between necessity and the variables used to test the level of necessity of cars are not significant for motorcycle users. The correlation between the necessity of motorcycles and length of ownership is significant at 10% level. The chi-square tests between the necessity of motorcycles and occupation as well as household income are not significant. However, based on the contingency tables below from table 9, table 10 and table 11 show that 85% of motorcycle users mentioned that motorcycles are totally necessary, and 15% mentions quite necessary. There are no respondents who answered “Not very necessary”. Meaning that having motorcycles is very important for those people who live in Jakarta. As mentioned before that almost every household in Jakarta has motorcycles, as the data indicate 95.3% of total households having motorcycles.

Table 9. Necessity of Motorcycle by Length of Ownership

	<=5 years	6-10 years	>=11years	Total
Totally necessary	70 (86)	42 (76)	41 (93)	153 (85)
Quite necessary	11 (14)	13 (24)	3 (7)	27 (15)
Not very necessary	0 (0)	0 (0)	0 (0)	0 (0)
Total	81 (100)	55 (100)	44 (100)	180 (100)

$\chi^2 = 5.656$, $df = 2$, $p = 0.059$, number in parantheses is the percentage

Table 10. Necessity of Motorcycle by Respondent Occupation

	Business person or self-employed	Public servant or organization staff	Part-time job	Student	Others	Total
Totally necessary	20 (87)	97 (85)	13 (81)	15 (83)	8 (89)	153 (85)
Quite necessary	3 (13)	17 (15)	3 (19)	3 (17)	1 (11)	27 (15)
Not very necessary	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	23 (100)	114 (100)	16 (100)	18 (100)	9 (100)	180 (100)

$\chi^2 = 0.392$, $df = 4$, $p = 0.983$

Table 11. Necessity of Motorcycle by Monthly Household Income (million rupiahs)

	<7.9	7.0 – 8.9	9 – 11.9	>=12	Total
Totally necessary	57 (83)	31 (82)	34 (90)	31 (89)	153 (85)
Quite necessary	12 (17)	7 (18)	4 (10)	4 (11)	27 (15)
Not very necessary	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	69 (100)	38 (100)	38 (100)	35 (100)	180 (100)

$\chi^2 = 1.605$, $df = 3$, $p = 0.658$

During the survey it is also questioned what make them avoiding to use cars for commuting, with giving some factors and asked them to give responses to each factor by score, from very much (score 5) to not at all (score 1). Table 12 displays their responses where the traffic congestion is the most reason to avoid driving a car, then at the second and third rank is related to parking, both parking cost and parking availability at destination and the unreliability of parking. The stress of driving is also in the fourth rank that could deterrence people from driving. Moreover, the traffic congestion is the triple time that deters respondents to drive a car compared to parking costs and the parking availability. Regarding toll and petrol costs are not the most factors deterrence from driving a car. It is because the toll cost and petrol cost in Indonesia are cheaper compared to other countries and still affordable by people. Furthermore, the petrol cost is still subsidized by government and the price is about 0.6 USD per liter recently.

The results for motorcycle users regarding the factors that deter from driving a motorcycle is shown in Table 13. Traffic congestion is still in the first rank, but it is accompanying by the stress of driving. Driving a motorcycle is much more stressful compared to driving a car because the safety is very low. Then, the next factors are related to the parking: second rank is parking cost; third rank is parking availability, and fourth rank is the unreliability of parking.

Table 12. Rank of Factors Deterrence from Driving a Car

Factors	Not at all	Not very much	Neutral	Quite a lot	Very much	Average	Rank
Traffic congestion	7	22	14	54	83	4.02	1
Parking costs at destination	3	35	59	55	28	3.39	2
Parking availability at destination	2	37	54	63	24	3.39	2
Unreliability of parking availability	1	44	62	59	14	3.23	3
Toll cost	5	49	85	37	4	2.92	6
Petrol cost	4	44	68	57	7	3.11	5
Route unfamiliarity	8	89	64	18	1	2.53	7
Stress of Driving	9	39	65	55	12	3.12	4

Table 13. Rank of Factors Deterrence from Driving a Motorcycle

Factors	Not at all	Not very much	Neutral	Quite a lot	Very much	Average	Rank
Traffic congestion	15	21	21	42	81	3.85	1
Parking costs at destination	8	37	48	50	37	3.39	2
Parking availability at destination	2	41	66	50	21	3.26	3
Unreliability of parking availability	3	50	64	47	16	3.13	4
Petrol cost	16	72	61	27	4	2.62	6
Route unfamiliarity	7	49	55	54	15	3.12	5
Stress of Driving	15	21	21	42	81	3.85	1

4. Discussion

The number of cars and motorcycles will increase continuously as well as the travel distance is significantly increased. Since the quality of public transport services is not improved yet, commuters prefer to shift to motorcycles for daily commuting. The provision of integrated public transportation is still limited. Only Bus Rapid Transit (BRT), known as TransJakarta, is integrated with Jabodetabek railway at some points. It makes people quite difficult to change to other types of transportation modes. The punctuality of public transportation is also very low, and even much public transportation does not implement the fixed schedule. As a result, the congestion is getting worse, and pollution from transportation is also increased.

In addition, fuel price, which is partly still subsidized by the government, is one of factor deterrence from driving. Although now Indonesia has become net oil import country, until at the end 2014 the government of Indonesia is still giving subsidy especially for transportation fuel such as petroleum until at the end of 2014 and diesel fuel until now. The diesel fuel is still having fixed subsidy by 1,000 IDR (Indonesian Rupiahs) or equal to 0.1 USD (United State Dollar) per liter. The current petroleum price without subsidy is about 6,700 IDR or only increased by 12% compared to the last year price. The few increase of fuel price is because the international market fuel price now is decreasing. As the consequence, if the operational cost in using private vehicle is

very low, it discourages people not leaving their vehicles.

Congestion and parking facilities such as the availability, reliability of parking place and the parking price become the most factors that people do not want to use their cars and motorcycles. Obviously almost in every building including offices, malls they provide parking facilities for cars and motorcycles. Even, if the small shop they do not have a parking area, people can use pedestrian for parking their vehicles or on street parking that is very cheap. However, by only make restrictions discourage people in using private vehicles without any commitments from government to provide better public transport with better services, it is pointless. Now, in Jakarta is constructing to build the MRT as the other alternative transport mode that is expected can give better services. Moreover, this also should be supported by other policies such as park and ride system, where parking areas are needed at the points of public transports stops. Other types of policies, such Transit Oriented Demand are also needed to implement.

5. Concluding Remarks

Based on the analysis, it is shown that there are different numbers between male and female. Most of the commuters are in the productive ages between 25-year-old and less than 45-year-old. The education levels of commuters are getting increase although it is still dominated by the senior high school level, and it inline with the average income of commuters that has been increasing significantly within the last six years.

Regarding the commuters behavior, it describes that the distance of commuters has been increased, and it is confirmed by the increasing numbers of commuters from the buffer areas of Jakarta, BoDeTaBek. Private vehicles are still to be the commuters' favorite, especially motorcycles which are chosen by commuters in all the income ranges and it is different from car users that most of them have high-income level. As a consequence, the share of public transport has been decreasing. These findings are supported by the model used to know the factors affected the transport modes chosen. From the parameter estimations, it shows clear evidence that the private vehicle users either cars or motorcycles have higher education level compared to the public transport users. Most of the private vehicle users are workers and live farther than the public transport users. However, the transport cost is also bigger than the cost of using public transport. Meaning that, for people who face longer commutes, cars become more attractive options, especially with a higher wage level and opportunity cost of commuting time.

The attitudes of private vehicle users can be defined based on their main reasons choosing either cars or motorcycles to commute and how their dependency on the private vehicles. The main reasons for using cars and motorcycles are more comfortable, more flexible and could save the time especially for motorcycles. Their dependences to cars and motorcycles are very high because of lack of services in public transportation such as the punctuality, not integrated with them, security and safety as well.

6. The Policy Implications

There is no such kind of policies to discourage people to use private vehicles especially motorcycles. Some policies have been introduced such as 3 in 1 system, in the CBD area of Jakarta since 2005 to burden people to use their cars, it does not work well. People still can through the areas with using jockey and pay them with a small amount, maximum 20,000 IDR or about 2 USD. To burden the cars or motorcycle to enter the CBD areas can use road pricing, no matter the number of passengers inside, as long as it passes through the CBD areas, it will be charged. The area pricing scheme can levy rate the shifting of private vehicle users to BRT (Yagi and Abolfazl Mohammadian, 2007).

Moreover, people will give up in using their vehicles if no parking space and the parking price is expensive. So, government should impose the parking price especially in CBD area and provide parking space at some stations such as some main points of TransJakarta, Jabodetabek railway, then people can follow park and ride system, where they can use their cars or motorcycles from home to the stations and continuing by using mass public transport. At the same time, the government should improve the services of public transportation through increasing the frequency, improving the punctuality, safety, and security. A previous study conducted by Zhang, Z. et al. (2014) mentioned that by giving incentive to the commuters through reducing the ticket price and also provide additional entertains such as fast food restaurant that including into the ticket as well as giving free wifi in public transport areas can improve the commuters' utility. However, before implementing those such policies, it is needed to study further either the policies can well implement in Jakarta or not.

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