KERTAS KERJA

SS1 (ICRA):

"Comparative Analysis of Motorcycle Utilization and Frorecasting Model of Motorcycle Ownership of Eastern Asian Countries"

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motorcycles registered annually in Malaysia is about 50% - 60%, that is approximately 5.8 million motorcycles, with an average annual growth rate of approximately 7% (Highway Planning Unit, Ministry of Works Malaysia, 2003). Therefore, the fast growing rate of motorcycle ownership in Malaysia has become a critical issue in the safety and management of traffic system in Malaysia.

Currently, there are many researches conducted around the world on car ownership such as the studies conducted by Button et al (2003) on the factors influencing the ownership of vehicles in low income countries, Dargay (2002) on the factors determining car ownership for households living in rural and urban areas, Medlock and Soligo (2002) on developing a model that predicts the relationship between economic development and the per capita rate of private ownership of cars and so on. Dissanayake and Morikawa (2002) also have conducted a study on household travel behavior variations relating to vehicle ownership particular car and motorcycle ownership, mode choice and trip-chaining considerations by using Bangkok metropolitan region as a case study. However, not much research has been conducted to investigate the characteristics of motorcycle ownership particularly in Malaysia. Hence, in this research, a disaggregate choice model describing motorcycle ownership will be developed. Development of this model will give an indication on the future trend of motorcycle ownership in Malaysia.

MOTORCYCLE MARKET IN MALAYSIA

Motorcycle ownership in Malaysia

In Malaysia, vehicles composition registered annually consists mainly of passenger cars, motorcycles, buses, medium and heavy lorries and almost 50% of the vehicles registered are motorcycles. The number of motorcycles estimated on the road in year 2002 is approximately 5.8 million, compared to 5 million passenger cars (Highway Planning Unit, Ministry of Works Malaysia, 2003). Motorcycle ownership in Malaysia has also increased rapidly from 0.13 motorcycles per person in year 1990 to 0.23 motorcycles per person in year 2001. Conventionally, Malaysians prefer to purchase smaller motorcycles in the range of 70 cc to 115 cc. Large motorcycles are available but not very practical because during traffic congestion there is simply not enough space for large motorcycles to weave in and out of queuing vehicles to get to the front. Nevertheless, the majority of motorcycle owners does not own a car and belong to the lower and middle-income group. Figure 1 shows the traffic composition in Malaysia from year 1963 to year 2002. However, for other types of motorized vehicles such as lorries, trailers and buses, the data available are only for year 1987 to year 2002.

Factors affecting motorcycles demand in Malaysia

Motorcycles market in Malaysia will sustain and continue to grow in the future due to several factors. One of the main contributing factors is traffic congestion. As a result of the increasing number of vehicles on the road every year, traffic congestion has reached a critical level especially in the city center. Hence, motorcycles are a useful mode of transportation for commuting within the city area especially during traffic congestion due to its small size and high maneuverability. Furthermore, many roads in Malaysia are very narrow due to space constraint especially in states such as Penang and as well as in rural areas, where the roads there are small and undeveloped. Therefore, motorcycles are the preferred mode of transportation in those situations. Apart from that, the lower income group still depends heavily on motorcycles for transportation to save cost. Parking rates for motorcycles in most of the buildings within the city areas are usually cheaper and sometimes free of charge as compared to parking rates for cars. Besides that, parking spaces for motorcycles are a lot easier to find as compared to cars. Inefficient public transportation also prompted higher motorcycles demand among the lower income group.

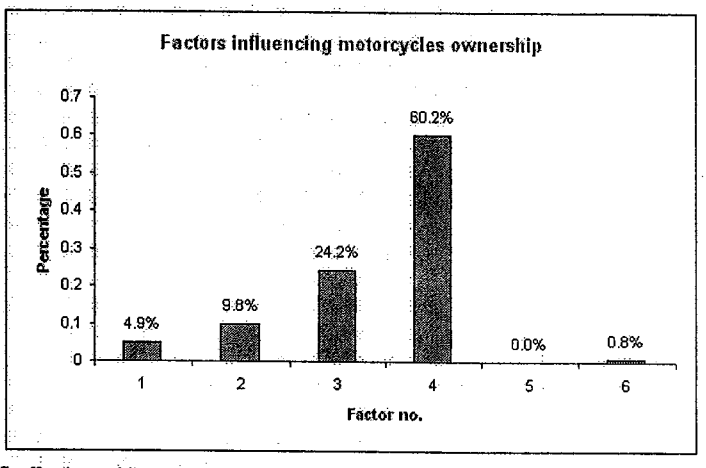
DATA CHARACTERISTICS

Survey

The data used in this research were collected from the interview survey conducted in the state of Penang from October 2004 to July 2005. The survey consists of just one page of questions, divided into two sections. In the first section, personal background data such as gender, race, age, marital status, monthly income, motorcycle and car ownership data, commuting purpose, destination and distance traveled using either a car or motorcycle or both were asked. Apart from that, monthly expenses on transportation as well as major factors influencing the decision to purchase either a car or motorcycle of both were asked. In the subsequent section, household information was collected. In this section, the household data such as number of family members that reside together, total household monthly income, total number of cars owned, total number of motorcycles owned and number of family members having car and motorcycle driving license were required.

Characteristics of survey data

In the survey conducted, data from a total of 547 respondents were collected. Upon discarding the uncompleted surveys as well as surveys with too much misleading data or data with errors, 435 surveys were retained for an overall response rate of 79.5%. Table 1 shows the number and percentage of three motorcycle ownership levels stratified by gender, race and marital status. Based on Table 1, the results showed that majority of motorcycles owners are Malay male while marital status does not have a significant impact on motorcycles ownership.



Factor no. 1 = Ineffective public transportation
2 = Cannot afford to own a car/ motorcycle is cheaper and more affordable
3 = Save more fuel as compared to a car and toll charges are cheaper
4 = More convenient and save time especially during traffic jams
5 = Walking or cycling is dangerous
6 = Good road infrastructures and networks such as providing exclusive motorcycle lanes at highways

Figure 3: Factors influencing motorcycles ownership

Table 4 shows the number and percentage of three motorcycle ownership levels stratified by three levels of car ownership. From the survey conducted, as many as 394 respondents (90.6%) have car driving license and 337 respondents (77.5%) have motorcycle driving license.

Table 4: Number and percentage of three motorcycle ownership levels stratified by the number of cars owned individually

	Car Ownership					
	0 car	%	1 car	%	2 plus car	%
0 motorcycle	37	27.41%	118	45.04%	16	42.11%
1 motorcycle	95	70.37%	130	49.62%	13	34.21%
2 plus motorcycles	3	2.22%	14	5.34%	9	23.68%
Total	135	100.00%	262	100.00%	38	100.00%

From the questionnaire survey conducted, based on a total of 435 respondents, 300 of the respondents owned at least 1 car. According to the surveys, the main factor that influences car ownership is due to the hot and rainy weather in Malaysia. Figure 4 shows other factors that influences cars ownership.

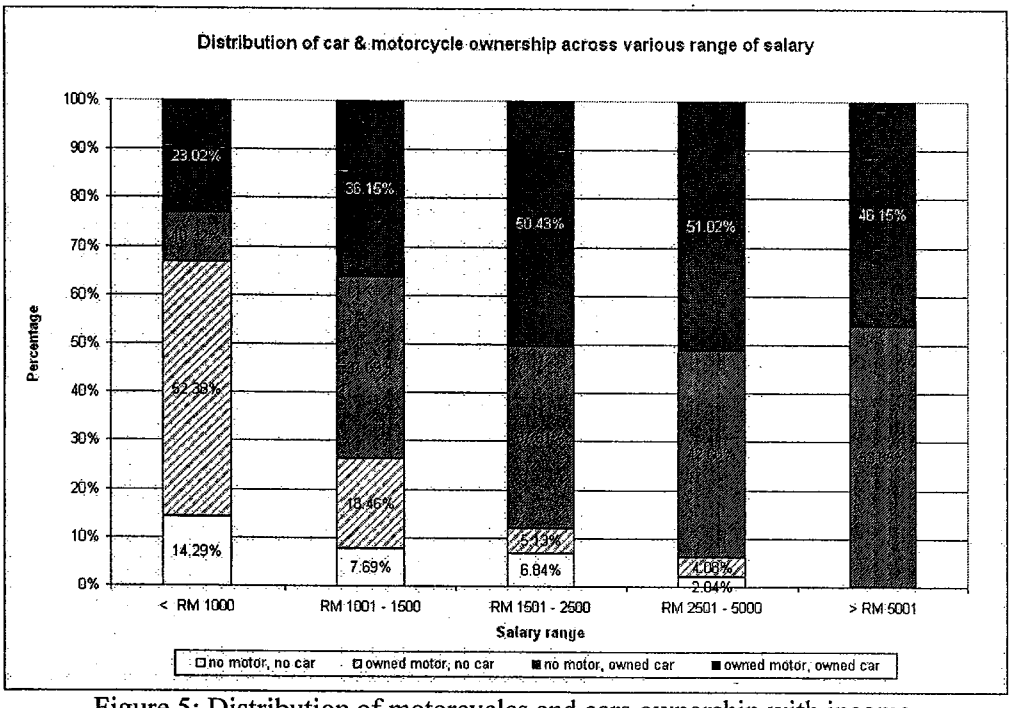


Figure 5: Distribution of motorcycles and cars ownership with income.

Figure 6 shows the total monthly expenditures on transportation. Majority of Malaysians spent less than 10% of their monthly income of transportation.

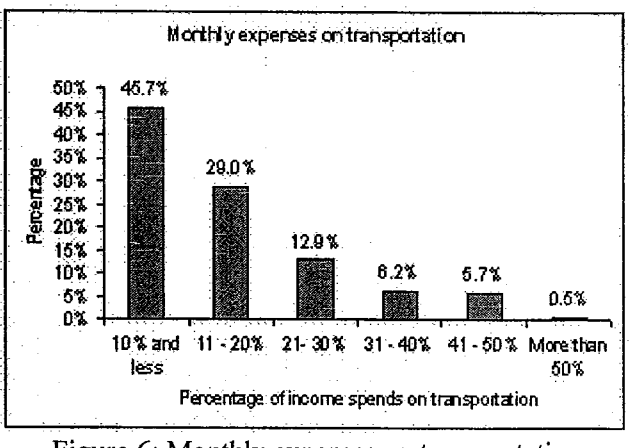


Figure 6: Monthly expenses on transportation

From the questionnaire survey conducted, based on a total of 435 respondents, 135 respondents (31.0%) do not own a car and 171 respondents (39.3%) do not own a motorcycle. Therefore, from 69% of the respondents who own at least 1 car and 60.7% respondents who own at least 1 motorcycle, the comparisons between car and

Figure 11 shows the total number of cars in the household. Based on Figure 11, majority of households in Malaysia have 1 to 2 cars and the average number of cars in a household is 1.62 cars per households.

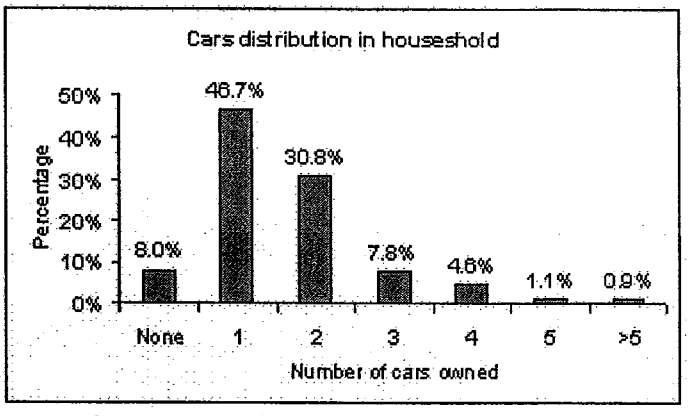


Figure 11: Total number of cars in households

Figure 12 shows the total number of motorcycles in the household. Based on Figure 12, majority of households in Malaysia have 1 to 2 motorcycles and the average number of motorcycles in a household is 1.43 motorcycles per households.

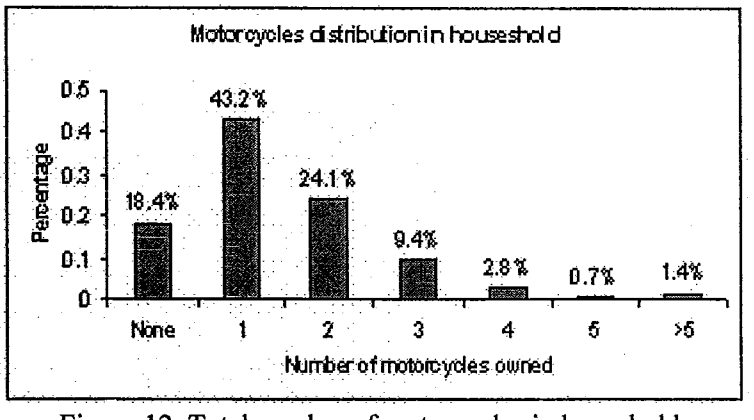


Figure 12: Total number of motorcycles in households

Figure 13 shows the total number of family members in a household that have car driving license. Based on Figure 13, on the average, there are 2.53 car driving license holders in the households.

Figure 14 shows the relationship between motorcycles and cars ownership with income.

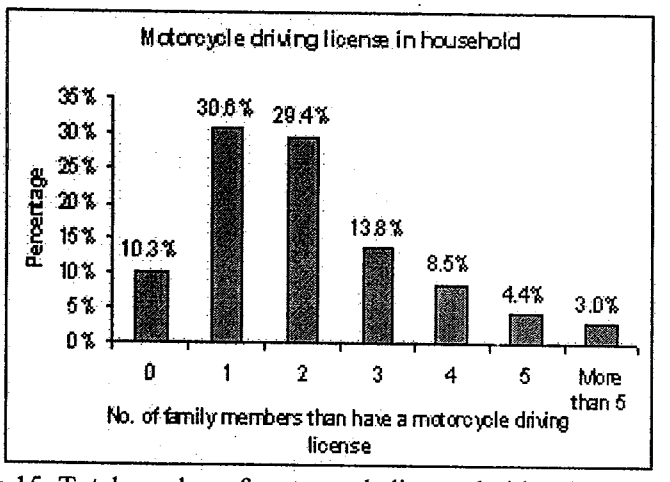


Figure 15: Total number of motorcycle license holders in households

Therefore, based on the results obtained from the survey, disaggregate choice models for motorcycle ownership were developed using the statistical software known as *SPSS.*

DISAGGREGATE CHOICE MODELS FOR MOTORCYCLE OWNERSHIP

Disaggregate choice models using multinomial logistic regression for motorcycle ownership was developed separately for individual motorcycle ownership and household motorcycle ownership. This is to explore on the differences of explanatory variables used to develop the individual motorcycle ownership and household motorcycle ownership models.

Disaggregate choice model for individual motorcycle ownership

The explanatory variables used in the model and the coefficients obtained are as shown in Table 5 and the reference category is no motorcycle. The explanatory variables have been chosen to maximize model fit. Commuting distance and marital status was found to be insignificant and therefore were removed from the model. In this model, upon conducting various analyses using different combinations of income groups, it can be concluded that only 3 income groups that are significant. They are the low income (< RM 1000), medium income (RM 1001 – RM5000) and high income (>RM 5001).

Disaggregate choice model for household motorcycle ownership

The explanatory variables used in the model and the coefficients obtained are as shown in Table 6 and the reference category is no motorcycle. Household car ownership was found to be insignificant and was removed from the model.

Table 6: Household motorcycle ownership results

Terms on the 1 motorcycle alternative	Coefficients	Sig.
Intercept	-2.228	0.000
Household income: < RM 1000	1.997	0.007
Household income: RM 1001 – RM 1500	1.299	0.031
Household income: RM 1501 – RM 2500	1.197	0.009
Household income: RM 2001 – RM 5000	1.178	0.007
Household income: > RM 5000	0*	-
Household members: > 6 persons	2.104	0.003
Household members: 3 – 6 persons	1.647	0.000
Household members: 1 – 2 persons	0*	-
Household car license holder: 1 person	-1.595	0.002
Household car license holder: 2 persons	-0.977	0.017
Household car license holder: 3 persons and more	0*	-
Household motorcycle license holder: 1 person	2.489	0.000
Household motorcycle license holder: 2 person	2.177	0.000
Household motorcycle license holder: 3 persons and more	0*	-
Terms on the 2 plus motorcycles alternative	**Coefficients**	**Sig.**
Intercept	-2.335	0.000
Household income: < RM 1000	2.399	0.004
Household income: RM 1001 – RM 1500	2.666	0.000
Household income: RM 1501 – RM 2500	1.756	0.000
Household income: RM 2001 – RM 5000	1.739	0.000
Household income: > RM 5000	0*	-
Household members: > 6 persons	2.941	0.000
Household members: 3 – 6 persons	2.528	0.000
Household members: 1 – 2 persons	0*	-
Household car license holder: 1 person	-1.539	0.003
Household car license holder: 2 persons	-1.399	0.001
Household car license holder: 3 persons and more	0*	-
Household motorcycle license holder: 1 person	-1.172	0.026
Household motorcycle license holder: 2 person	1.084	0.010
Household motorcycle license holder: 3 persons and more	0*	-
Pseudo R-square	**0.451**	

*Note: * This parameter is set to 0 because it is redundant given the intercept term.*

As mentioned before, parameters with positive coefficients increase the likelihood of that response category and parameters with significant negative coefficients decrease the likelihood of that response category with respect to the reference category. Hence, the negative coefficients for household car license holder categories in Table 5 shows that households with at least one person having a car driving license will decrease the likelihood of owning any motorcycle. As well as for the 2 plus motorcycles

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