

**MODELING MODE CHOICE BEHAVIOR OF MOTORCYCLISTS IN
MALAYSIA**

By

IBRAHIM SHEIKH ABDUL KADIR HAGI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirement for the Degree of Doctor of Philosophy**

October 2006

DEDICATION

Especially dedicated to:

My beloved father Sheikh Abdul kadir

&

My mother Maleika Hagi Ibrahim

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Chairman: Professor Ir. Radin Umar Radin Sohadi, PhD

Faculty: Engineering

In Malaysia, motorcycle use has grown in popularity in the past decades and this has resulted in increased casualties among motorcyclists. However, earlier studies focused primarily on motorcycle safety issues rather than identifying factors that influence motorcycle use and motorcyclists' mode choice behavior. To overcome these problems, this study focused on the concept of exposure control measures such as an alternative to road transport as a countermeasure aimed at shifting motorcycle users to other safer modes in order to reduce the number of motorcycle road accidents. This study developed a model for motorcyclist mode choice behavior and potential mode shift from the motorcycle to other safer modes.

A cross-sectional survey of mode choice among bus, car and motorcycle users in Selangor state, Malaysia was conducted. Selangor state was chosen for the study as it has the highest number of motorcycle crashes in Malaysia. A total of 810 randomly self-administered questionnaires were collected from the household surveys for each mode user over a period of 6 months. Among the data collected were the demographic details, such as income, age, gender, and educational level, trip characteristics, and travel behavior of each mode user. In order to assess the relative importance of demographic, socio-economic and service attributes that influence travelers' mode choice behavior, discrete choice models were developed in the form of a binomial logit (when there are only two choices), and the multinomial logit (when there are more than two choices)

For the motorcycle and bus model, the results suggested that travel time and travel cost are characteristics that determine why motorcycle use is the favored modal choice. The estimated coefficients for travel time and travel cost for the bus mode are negative, implying that an increase in travel time and travel cost for the bus mode is likely to increase the probability of a motorcyclist to continue choosing the motorcycle as the preferred mode of transport. In order to promote greater use of public transport services, the study examined the probability of motorcycle riders shifting to public transport based on a scenario of a reduction in bus travel time and travel cost. The results of the predicted mode share probability show that when the bus and motorcycle are equally fast, 38% would use the motorcycle and 62% the bus

The motorcycle and car model examined the influence of future income and car ownership on mode shift. The results of the model predict that when the income level

of motorcyclists reaches RM 2500 (about US\$700) per month, the probability of motorcycle use would drop from 80% to 57%. At the same time, the probability of car commuters would increase from 20% to 41%. According to a World Bank study, if the current rates of economic growth continue uninterrupted, per capita income for Malaysia is expected to reach RM 2000 by the year 2013. According to our 8th Malaysia plan, the per capita income growth target under Vision 2020 is expected to be RM 3166. Therefore, a 29% reduction in motorcycle use is expected to be achieved between years 2013-2020.

Similar trends were found for household car ownership. The results showed that ownership of one car in the household would result in a 14% reduction in motorcycle use, while ownership of two cars would result in a 42% reduction in motorcycle use relative to car use. Therefore, the study suggests that improvements in motorcyclists' income and car ownership would have the greatest impact in influencing the mode preference of motorcyclists, and result in a significant reduction in motorcycle use and a shift towards safer modes of transport.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**PERMODELAN KELAKUAN PEMILIHAN MOD PENUNGGANG
MOTOSIKAL DI MALAYSIA**

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Di Malaysia, penggunaan motosikal semakin popular dalam dekad yang lepas dan ini telah mengakibatkan pertambahan kecelakaan di kalangan penunggang motosikal. Walaubagaimanapun, kajian terdahulu hanya memfokuskan kepada isu keselamatan motosikal berbanding mengenal pasti faktor-faktor yang mempengaruhi penggunaan motosikal dan gelagat pemilihan mod penunggang motosikal. Untuk menyelesaikan masalah ini, satu kajian yang fokus kepada konsep ukuran kawalan pendedahan seperti alternatif kepada pengangkutan jalan sebagai langkah keselamatan dengan matlamat mengalihkan pengguna motosikal kepada mod yang lebih selamat dengan satu makna untuk mengurangkan bilangan kemalangan motosikal. Kajian ini mendirikan satu model untuk mod kelakuan permodelan dan potensi peralihan dari motosikal kepada mod yang lebih selamat.

Satu kajian keratan mod pilihan di kalangan pengguna bas, kereta dan motosikal di negeri Selangor, Malaysia telah dilaksanakan. Negeri Selangor dipilih untuk menjalankan kajian ini kerana bilangan kemalangan yang melibatkan motosikal adalah paling tinggi di Malaysia. Sejumlah 810 kaji selidik penyelenggaraan sendiri secara rawak telah dikumpulkan daripada ahli isirumah untuk setiap jenis pengguna mod selama 6 bulan. Di antara data yang dikumpulkan adalah butir-butir demografik seperti pendapatan, umur, jantina dan tahap pendidikan, ciri-ciri perjalanan, dan kelakuan perjalanan untuk semua mod pengguna. Untuk menilai kepentingan relatif mod kelakuan pemilihan perjalanan, model pilihan diskrit telah dibangunkan dalam bentuk logit Binomial (bila hanya ada dua jenis pilihan) dan logit Multinomial (bila ada lebih daripada dua pilihan).

Untuk model bas dan motosikal, keputusan menunjukkan bahawa masa dan kos perjalanan merupakan ciri-ciri yang menentukan mengapa penggunaan mod motosikal lebih digemari. Keputusan model taksiran untuk masa dan kos perjalanan untuk mod bas adalah negatif, di mana ia menunjukkan peningkatan dalam masa dan kos perjalanan untuk mod bas akan meningkatkan kebarangkalian penunggang motosikal untuk terus memilih motosikal sebagai mod pengangkutan. Untuk menggalakkan penggunaan perkhidmatan pengangkutan awam, kajian ini menyelidik kebarangkalian penunggang motosikal untuk beralih kepada pengangkutan awam berdasarkan senario pengurangan dalam kos dan masa perjalanan bas. Keputusan daripada kebarangkalian anggaran mod kongsi menunjukkan apabila bas dan motosikal adalah sama cepat, 38% akan memilih untuk menggunakan motosikal manakala 62% akan memilih bas.

Model motosikal dan kereta mengkaji kesan pertambahan pendapatan dan pemilikan kereta terhadap peralihan model. Keputusan kajian ini menganggarkan bahawa apabila pendapatan penunggang motosikal meningkat kepada RM 2500 (US\$700) sebulan, kebarangkalian penggunaan motosikal akan berkurangan dari 80% kepada 75%. Pada masa yang sama, kebarangkalian penggunaan kereta akan bertambah dari 20% kepada 40%. Menurut kajian Bank Dunia, jika kadar semasa pertumbuhan ekonomi terus meningkat, pendapatan per kapita untuk Malaysia dijangka mencecah RM 2000 menjelang tahun 2013. Menurut Rancangan Malaysia ke-8, target pertumbuhan di bawah Wawasan 2020 dijangka mencecah RM 3166. Oleh itu, pengurangan sebanyak 29% dalam penggunaan motosikal dijangka akan dicapai di antara tahun 2013-2020.

Tren yang sama didapati untuk pemilikan kereta isirumah. Keputusan menunjukkan pemilikan sebuah kereta dalam isirumah akan mengakibatkan 14% penurunan penggunaan motosikal, manakala pemilikan dua buah kereta akan menyebabkan 42% penurunan penggunaan motosikal berbanding penggunaan kereta. Oleh itu, kajian ini mencadangkan bahawa peningkatan dalam pendapatan penunggang motosikal dan penggunaan kereta akan mempunyai impak yang besar dalam mempengaruhi mod pemilihan penunggang motosikal, dan menyebabkan pengurangan yang signifikan dalam penggunaan motosikal dan beralih kepada mod pengangkutan yang lebih selamat.

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I certify that an Examination Committee has met on 2/10/ 2006, to conduct the final examination of Ibrahim Sheikh Abdul Kadir Hagi on his Doctor of Philosophy thesis entitled “Modeling Mode Choice Behavior of Motorcyclists in Malaysia” in accordance with Universiti Pertanian Malaysia (High Degree) Act 1980 and Universiti Pertanian Malaysia (High Degree) Regulations 1981. The committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations, which have been duly acknowledge. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

IBRAHIM SHEIKH ABDUL KADIR HAGI

Date: 25 April 2007

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