CHAPTER 1

INTRODUCTION

CHAPTER 1: INTRODUCTION

1.0 Research Background

As experienced by many developing countries, Malaysia has also witnessed an explosive growth in the demand for mobility in recent decades in conjunction with its rapid economic growth. The highest growth of urbanization and motorization was recorded in Kuala Lumpur and Klang Valley Region. The number of vehicles registered in Kuala Lumpur has increased from 541,000 in 1991 to 1,968,388 in July 2001. The rates of increase in car ownership are generally the highest in Kuala Lumpur than any other parts of the country (Abdullah 1997). In July 2001, out of 4.4 million car registered nationwide, 1.2 million were registered in Kuala Lumpur and another 0.6 million in the Selangor state. Car ownership in the Klang Valley Region has increased from 247 vehicles per 1000 person in 1990 to 546 and 994 vehicles per 1000 person in 1996 and 2002 respectively, far beyond the national level of 91 vehicles per 1000 person in 1990, 133 in 1996 and 210 vehicles per 1000 population in 2002 (Malaysia 2004).

The increasing growth rates of car ownership consequently, will bring about direct positive impacts on both mobility and accessibility, which are also part of quality of life measurement. The increase in car ownership has increased the transport and communications index by 15.1 points during the period between 1990 and 2000 (Malaysia 2002). From a ratio of 1 car for every 32 people in 1973, this factor is considerably reduced to 6 and 4 people per car in 1990 and 2000 respectively (Abdullah

1997). This improvement contributed to easier accessibility and greater mobility, facilitating movements of persons.

The increase in car ownership, however, has a profound effect on the demand for travel by private mode. This could be observed by the increase in the percentage of trips using private transport. The percentage has increased significantly from 47 percent in 1985 to 71 percent today, while the share of public mode of transportation dropped to 16 percent from 35 percent in the similar period (Utusan: 11 September 2004).

Recent augmentation in car usage is worrying to both policy makers and concerned citizens alike. There is growing concern for noise and atmospheric pollutions, traffic congestion, accidents, energy use and conservation, and general environmental decay, as the result of excessive use of the motor vehicles. The ubiquitous use of motor vehicles has become formidable threat to the natural environment and to the quality of social and economic life. There is therefore an urgent need to reduce this trend of growth. The ownership and use of motor vehicles must be significantly reduced in the years to come. There must be a compromise between the desire and the need to travel. The concept of sustainable development as applied to the area of human mobility and transportation can only materialize when motorized transport is limited to serving only the essential needs of society (Abdullah 1997).

With the increase in car ownership, it was estimated that the demand for travel to the central area of the city will increase far beyond the capacity of the road network. The

strong fleet growth as compared to low road network growth has resulted in a rising vehicle-density ratio in Malaysia. The ratio reached the number of 71 vehicles per road kilometer in 1999 as compared to only 46 vehicles in 1994, further intensifying the issue of traffic congestion. The difficulty of constructing new roads or widening the existing ones, especially in Kuala Lumpur area, are due to the fact that the area has already been built up which makes land acquisition difficult and costly (Morikawa et al 2003).

The government has realized the importance of an effective travel demand management in order to reduce the traffic tension. There are several transportation planning done in the Kuala Lumpur and the Klang Valley area since 1960s. The first Kuala Lumpur Transportation Study was undertaken in 1963. The main recommendations were the immediate improvements to the existing streets before 1965, improvements to the existing bus terminal, and a construction of a road network comprising an inner ring load, a middle ring road and circumferential roads. However, the recommendations of the study were not fully implemented due to inadequate funds. Policies towards encouraging use of public transport and reduction of private transport use during the peak hours were noticeably absent (Jamilah 1992).

In 1972-73, a Klang Valley Regional Planning was conducted in attempt to tackle the transport problem from a regional planning context with recommendation of land use-transport strategy of five separate and relatively self-contained towns[1] with medium growth rates and moderate population density. The following study, Urban Transport

[1] Kuala Lumpur is remain the principal center but major new growth centers need to be develop at Klang, Shah Alam, Bangi and Rawang.

Policy and Planning Study, was made in the period of 1973-74. This study has devoted a large attention in maximizing the use of public transport and to lessen the demand for road building program. Among others, the study proposed the introduction of a system of bus ways, bus-only and bus-priority streets in order to enhance public transport service. However, due to financial restriction, the government decided to implement the more urgent recommendations such as improvements to the inner and middle ring roads in order to disperse traffic away from the central area.

In 1976, the Second Kuala Lumpur Urban Transport Project was launch under The World Bank Fund. The main purpose of this project was to make more efficient use of existing and planned transport facilities in the Kuala Lumpur. The project proposed policies aimed at improving public transport[2], restraining private car usage by increasing parking charges and imposing area licensing scheme, and the building of new roads and improvement projects as well as traffic engineering and control measures.

However, several policy measures such as the Area Licensing Scheme and high-occupancy vehicle priority measures had proved to be contentious issues. Again the government has focused and spent the large portion of the fund on road-building. Jamilah (1992) noted several factors caused the failure of the project. First, the imbalance of emphasis towards the constructional parts of the project at the expense of more sophisticated, less-capital-intensive traffic management concepts. Secondly was the lack of coordination between the implementing agencies. The third factor was the absence of

[2] For example the introduction of mini bus services and traffic priorities for high-occupancy vehicles was introduced to improve the flow of public service vehicles in which buses would have priority or exclusive use.

adequate and suitable technically-qualified personnel. For example the failure of the Area Licensing Scheme was mainly because the lack of enforcement by traffic wardens and the shortage of personnel.

Apart from the transportation studies to manage the travel demand in Kuala Lumpur, the structure plans were also implemented. The basic framework of a master plan study is the interaction between land-use and transportation. In 1982, the Federal Territory (Planning) Act was adopted in which the Kuala Lumpur City Hall was obliged to prepare Structure and Local Plans for Kuala Lumpur area. The Structure Plan establishes a broad policy framework for the planning of the Federal Territory within a perspective period of 20 years (Jamilah 1992). The strategy calls for a balanced development of Kuala Lumpur through moderate development within the city center and much faster development in the outlying areas. The overall transport objective identified in the structure plan was to affect a 40 to 60 percent modal shift from private to public transport with the policy formulated in the Plan is that a Bus plus Light Rail Transit System be adopted as the major public transport system to handle future traffic demands within Kuala Lumpur and its conurbation.

In order to assist the Master Plan Unit in formulating a set of transport programs and policies that would complement the overall Structure Plan strategy for the development of Kuala Lumpur, the Kuala Lumpur Master Plan Transportation Study was held in 1981. According to Jamilah (1992), the study reiterated the need to restrain future traffic growth in the central core of the city, improve public transport service, provide

priority movement of high-occupancy vehicles and also recommended additional forms of mass transit. New roads and roads improvement were also recommended to provide accessibility to the new growth center. The study recommended the introduction of LRT system, which construction was approved by the government in 1984. The Study also viewed the need for traffic limitation policies in Kuala Lumpur has not diminished since the previous study in 1974. Thus, the study team proposed a traffic restraining policy in Kuala Lumpur consisting of four instruments of traffic control.

Although there were a lot of effort and recommendations made by the studies, majority of the proposals have not been implemented. The constraints take many forms, politically, financial as well as operational constraints (Jamilah 1992). Apparently one important caveat is the chosen of measure to be implemented. Road building and improvement, for example, will only ease the traffic in short period but it will, in the future, generate new traffic. The introduction of rail-based public transport system in 1980s failed to reduce the proliferation of private vehicle usage. This might be due to a lack of integration at the system level between the various modes and within mode. Infrastructure project such as LRT systems and the monorail is built without serious consideration of their role in the larger system. The multiple bus companies do not serve as efficient feeder services to the LRT systems, although one of the LRT operators provides feeder bus service within a 3 kilometer radius of its stations.

Recently, there has been raising attention to reconstruct the mass transport system in the Klang Valley Region to provide a comprehensive and efficient system, where

through the proposed Klang Valley Urban Transport Authority, the public transportation system in the region will be regulated. The establishment of the proposed regulatory authority will be initiated by the "Steering Committee of the Public Transport System in Klang Valley (INSPAK)". The committee will undertake measures to increase the quality of the light rail and existing bus services. Physical integration will be implemented to improve connectivity in public transport terminals, as well as the use of integrated ticketing and fare system which government believed will encourage greater use of public transportation, thereby reducing traffic congestion (NST: 11 September 2004).

Regardless of this proposal, the question of how will it affect the travel behavior of those using private vehicles remain a pertinent issue. Will the countermeasure taken by the government to promote the public transport usage in an effective manner? For a certain policy to be successfully implemented depends on the level of acceptance of the policy. The two important issues to address under transportation facilities include (1) reliable prediction of demand, and (2) efficient estimation of the users response to changes in prices and the characteristics of the services; i.e. the price and service elasticity. These two conditions are crucially important since they will guide policymakers towards the best policy to be undertaken.

1.1 Research Objectives

Information on the elasticity of urban transport demand with respect to price or service level is very important in quantitatively analyzing the effects of urban travel demand management policies. However, there has been little research done in neither the area of elasticities of demand for car use nor the area of public transport in Malaysia so far. In this sense, quantitative evaluation of travel demand management (TDM) policies has been greatly limited in the Malaysian context.

Therefore, the main objective of this research is to provide information on the effectiveness of policy measures to reduce demand for trans-urban travel in private automobiles. Specifically, the study is intended to derive and analyze the demand function for trans-urban private transportation and to estimate the price elasticity of the demand function. In addition to the traditional price elasticity estimation, the research will also estimate the elasticity with respect to the service of amenity levels.

Rational of the Study

The findings from this study can be interpreted into policy evaluation in terms of identifying a more effective policy measures and thus aiding the policy makers to make a more informed choice in TDM. Empirical knowledge of the size and variability of travel demand elasticity has had an important effect on thinking about transport policy (Goodwin 1992). Low elasticity implies relatively ineffective levers for influencing demand (and correspondingly effective ones for influencing revenue), and circumscribe the sorts of policies which will be taken seriously. Zero elasticity, implied by the absence of certain relationships in traffic forecasting models, shift the attention of policy makers away from such aspects of behavior, in favor of those whose sensitively to price and other influences is quantified. Therefore, it is important for policy making to be informed by the best available information regarding the sensitivity of travel demand.

Thus, the findings from this research could offer the government the choice of a better policy to be implemented in order to reduce the problems arising from the increasing usage of private vehicles. The right choice of policy measure not only helps government to successfully alleviate the problem, but also to ensure that the scare resource of the government, like financial resource and manpower, are fully utilized. Besides, transportation planning and designation of transportation system are very much related. Therefore, to implement a policy or to undertake a certain project, the government has to consider the long term implications because once constructed, infrastructure built-up environment changes will be limited over a very long period. Possible future land-use and transport plans should be evaluated on the basis of a broad

range of indicators, including impact on accessibility, congestion, road safety, environmental impacts, residential preferences, and financial aspects (Wee 2002).

Potential User of the Study

The study will be relevant to policy makers because it could help the government to implement measures that will improve the efficiency of public transportation services to reduce the cost of doing business. This is more relevant as the priority will be given to reducing traffic congestion, especially in major cities to avoid wastage of manpower and time, thereby increasing productivity. Savings in travel time will also enable commuters to spend more quality time with their families. Thus, the study is expected to provide some input on how to plan and manage public transportation demand for growing urban center such as the Klang Valley.

1.2 Research Methodology

This study will use the primary data which will be obtained using the survey method. The survey design is based on Stated Preferences method. The approach has been widely used in transportation since it can measure how people choose not-yet-existing travel modes, or how people take actions in case of introducing new policies (Fujiwara et al. 2004). This approach examines individual response to a series of experimentally designed choice alternatives, which are typically described in terms of combination of attributes with several pre-defined levels.

The study area was defined by the administrative boundary of Klang Valley Region. The study will be conducted on randomly selected 300 passenger car users who travel daily within the region. The number of sample chosen is subject to the budget and the time constraint of the researcher. As the population of the region is large, multi-racial and made-up of different socioeconomic groups, the sample selection to be made will try to ensure that the sample is representative of the population, even though the sample size is relatively small.

Theoretical Framework[3]

The demand functions for passenger transportation are usually formed under the estimation of a utility maximizing representatives consumer, subject to his/her own budget constraint:

$$\max_{X,z} U(X,z) \qquad \text{such that } PX + qz = m$$

where U – utility of a consumer

P – average price of good x

X – amount of x demanded

q – vector of prices for other goods

m – available income

Since P is some scalar price index and X is some scalar quantity index where

$$P = f(p)$$

$$X = f(x),$$

we want to know when it will be the case that

$$X(P,q,m) \equiv X(f(p),q,m) = g(x(p,q,m))$$

For a *Marshallian demand function* of $X(P,q,m)$. This requires that we get the same value of X via 2 different routes;

i) *Hicksian separability*

The first situation is to impose constraints on the price movement, where we aggregate the prices first using $P = f(p)$and then maximize $U(X,z)$ subject to the budget constraint $PX + qz = m$.

[3] The theoretical framework of the study is entirely adopted from Variant (1992).

Suppose that the price vector p is always proportional to some fixed base price vector p^0 so that $p = tp^0$ for some scalar t. Following the general framework described above, let the price and quantity indices for the x-goods are defined by

$$P = t$$

$$X = p^0 x$$

We define the indirect utility function associated with these indices as

$$V(P,q,m) = \max_{x,z} u(xz) \qquad \text{such that } Pp^0 x + qz = m$$

A straightforward application of the envelope theorem shows that we can recover the demand function for the x-good by Roy's identity:

$$X(P,q,m) = -\frac{\partial V(P,q,m)/\partial p}{\partial V(P,q,m)/\partial m} = p^0 x(p,q,m)$$

This calculation shows that $X(P,q,m)$ is an appropriate quantity index for the x-goods consumption: we get the same result if we first aggregate prices and then maximize $U(X,z)$ as we get if we maximize $u(x,z)$ and then aggregate quantities.

Solve for the direct utility function that is dual to $V(P,q,m)$ by the usual calculation:

$$V(X,z) = \min_{P,q} V(P,q,m) \qquad \text{such that } PX + qz = m$$

By construction this direct utility function has the property that

$$V(P,q,m) = \max_{X,z}(X,z) \qquad \text{such that } PX + qz = m$$

Hence, the price and the quantity indices constructed this way behave just like ordinary prices and quantities.

ii) *Functional separability*

Under this situation, we impose constraints on the structure of preferences, where we first maximize $u(x,z)$ subject to $px+qz=m$ and then aggregate quantities to get $X=g(x)$.

Suppose that the underlying preference ordering has the property that

$(x,z)\,\phi\,(x',z)$ if and only if $(x,z')\,\phi\,(x',z')$

for all consumption bundles x, x', z, and z'. This condition says that if x is preferred to x' for some choices of other goods, then x is preferred to x' for all other goods. In other words, the preferences over the x-goods are independent of the z-goods.

Then it can be shown that the utility function for x and z can be written in form $u(x,z)=U(v(x),z)$, where $U(v,z)$ is an increasing function of v, that is the overall utility from x and z can be written as a function of the subutility of x, $v(x)$, and the level of consumption of the z-goods. By taking this form, the utility function is weakly separable.

To see the implication of separability about the structure of the utility maximization problem, we write the demand function for the goods as:

$x(p,q,m)$ and $z(p,q,m)$

and let the optimal expenditure on the x-goods as

$m_x = px(p,q,m)$

Thus, to find the optimal choice of the x-goods given if the overall utility function is weakly separable, is by solving the following subutility maximization problem:

$\max(v,x)$ such that $px=m_x$

This means that if we know the expenditure on the x-goods, $m_x = px(p,q,m)$, we can solve the subutility maximization problem to determine the optimal choice of x-goods. In other words, the demand for the x-goods is only a function of the prices of the x-goods and the expenditure on the x-goods on the x-goods, m_x. The prices of the other goods are only relevant insofar as they determine the expenditure[4].

Model Specification

Implementing the theoretical framework introduced by Lee et al. (2002), this study will estimate the utility functions of the original mode and the alternative modes for estimating logit model as follows:

$$U_{oricar} = \alpha + \beta_1 \text{ Fuel} + \beta_3 \text{ Ivt} + \beta_5 \text{ Park}$$

$$U_{altmode} = \beta_2 \text{ Fare} + \beta_3 \text{ Ivt} + \beta_4 \text{ Ovt} + \beta_6 \text{ Crowd}$$

where *altmode = bus, rail-based, transit+rail-based*

(***oricar***: original mode of passenger car, ***altmode***: alternative mode, ***fuel***: fuel price, ***fare***: fare of bus or rail-based transit, ***Ivt***: in-vehicle time, ***Ovt***: out-vehicle time i.e. interval accessing bus and access time in the subway, ***park***: parking fee, ***crowd***: crowdedness i.e. comfortableness as a service measure)

A survey will be conducted on 300 respondents who individually possess passenger car and travel within or into the Klang Valley Region. The data collected then will be used to estimate the utility functions. Using the estimated coefficients of the models, the price elasticity will be estimated.

[4] Refer to Appendix A for further proof of the applications of the theory.

1.3 Organization of the report

The research study is organizes in 4 chapters. The first chapter introduced the area of the study by highlighting the transportation issues in the Klang Valley region. The objectives of the study as well as the methodology of the study were also presented.

The second chapter discussed both theoretical concepts and empirical studies of elasticities of transportation demand. Theoretical concepts deal with the definition of elasticity, several different dimensions of the concept and its application in transportation realm. The empirical reviews highlight some findings on the elasticity of transport demand estimations.

Chapter three is devoted to the analysis of the survey findings in terms of some demographic characteristics and travel behavior of the respondents as well as the estimation of the elasticity of transport demand. Chapter four concludes with a summary of the research as well as some policy implications of the research results. Limitation of the study and suggestion for future study are discussed as well.