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Willingness-To-Pay for Monorail Services: Case Study in Penang, Malaysia

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ABSTRACT

The main objective of this study is to examine the determinants of consumers' willingness-to-pay for monorail transportation in Penang (Malaysia). Cross sectional primary survey data with a total of 498 respondents is used for the analysis via a censored regression model. The results demonstrate that habit of recycling, experience in using urban rail-based transportation and problems of insufficient cark parks have the significant effects on the willingness-to-pay for a trip of monorail to travel to work. Whereas, age, gender, ethnicity, income, education and personal perspective on public transportation system are found to have no significant impact on the willingness-to-pay for a trip of monorail to travel to work. Based on these findings, several policies are recommended.

Keywords: Congestion, monorail, transportation, willingness-to-pay, Malaysia

JEL classification code: D10, D12

INTRODUCTION

In this age of industrialisation society, the problems of heavy traffic congestion in Penang, which is one of the developed states in Malaysia, is getting more serious. Two primary reasons exist attribute to the said situation. First, the existence of great job opportunities in Penang where the free trade zone in Bayan Lepas posed as a centre to cluster all the labour-intensive manufacturing industries (Yeoh, 2011)[1]. Second, Penang ranks as the eighth most liveable cities in Asia, which has a very good standard of living (Tan, 2010). For these reasons, many people migrate to Penang. As a result of an increasing population in

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[1] Bayan Lepas is Penang's main factory area where consists of nearly 200 multinational companies (MNC).

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Penang, the demand for private vehicles in Penang increases in tandem which eventually results in the rise of and problem of serious traffic congestion, especially during office rush hours.

Report shows that there are approximately 2.21 million registered vehicles in Penang in 2010 with a large proportion of them are private owned vehicles (The Star, 2011). Despite of its small land capacity, Penang has the third most number of newly registered vehicles in Malaysia where a total of 110882 new vehicles are registered (The Star, 2011). Besides, it is noteworthy that there is currently a lack of public transportation in Penang due to a huge increase in travel demand. Worst of all, it is estimated that the travel demand will increase by approximately 25% – 50% by 2030 (Kaur, 2012). Kaur (2012) also highlighted that if the authorities can improve the public transportation system in Penang, the third link between the island and mainland would not be necessary. In view of these serious traffic woes in Penang, monorail (i.e. urban rail-based transportation) is proposed by the government as the solution to these matters. However, the project has been rejected indefinitely after being reviewed. Hence, not much significant traffic improvements have been made thus far.

Given the fact that Penang residents are often burdened with having to put up with serious daily traffic congestion problem daily, the monorail system appears to pose as the most viable alternative public transportation to overcome this problem. However, a fundamental question yet to be answered is whether there exist the significant benefits received by the residents in using this alternative transportation mode in the debate of how much an individual is willing to pay for the monorail system as an alternative public transportation to avoid congested roadways. The main research question that arises include what factors will affect individual's willingness-to-pay (WTP) for the monorail as an alternative public transportation to work daily. A better understanding of these determinants is important for the public policymakers in promoting usage of the monorail system, in solving the traffic congestion problem as well as for future planning purposes. Considering this research gap, present study attempts to contribute to the existing literatures and society by investigating the determinants of WTP for the monorail system in Penang.

THEORETICAL FRAMEWORK

In present study, the SLOTH model, which originally introduced by Cawley (2004), is used as a proxy to explain individuals' behaviour in using public transport. SLOTH is a model to describe how individuals allocate their time on various activities in order to maximise their utility. Specifically, the SLOTH model is written as:

$$U (S, L, O, T, H) \quad (1)$$

where, U = utility; S = time spent in sleeping; L = time spent in leisure activities; O = time spent in occupation; T = time

spent in transportation; and H = time spent in home activities. All of these activities possess direct impacts on individuals' utility but the impacts may vary across individuals.

According to Cawley (2004), SLOTH model also refers to the time constraint that individuals face when maximising their utility. Since there is only 24 hours per day, the sum of the time spent in SLOTH must equal to 24. As such, the time constraint that based on SLOTH model is written as:

$$S + L + O + T + H = 24 \quad (2)$$

As argued by Cawley (2004), if given the choice, individuals would rationally choose to allocate their time in the activity that could yield larger marginal net utility. For example, if the marginal net utility of spending time in public transport is smaller than private owned vehicle, rational individuals will choose to use more private owned vehicle than public transport. However, by holding the marginal net utility of spending time in private owned vehicle constant, if the marginal net utility of spending time in public transport rises dramatically due to an improvement in public transport system, individuals would tend to reallocate their time and choose to spend more time in public transport than private owned vehicle.

Moreover, Cawley (2004) also emphasised that individuals maximise their utility depend on their budget constraint. Given the limited resources, individuals need to choose to purchase between transportation goods and other non-transportation goods. Assuming that individuals are not allowed to borrow money, the money that individuals spend on transportation goods and other non-transportation goods must equal to their earning. As such, the budget constraint is expressed as:

$$Y.P_Y + X.P_X = W.O \quad (3)$$

where, Y = amount of non-transportation goods purchased; P_Y = price of non-transportation goods; X = amount of transportation goods purchased; P_X = price of transportation goods; W = hourly wage; and O = time spent in occupation.

Similarly, if given the choice, individuals would rationally choose to spend their money on the goods that could yield larger marginal net utility. For instance, if the marginal net utility of spending money on private owned vehicle is larger than public transport, rational individuals will choose to use more private owned vehicle than public transport. However, by holding the marginal net utility of spending money on private owned vehicle constant, if the marginal net utility of spending money on public transport rises due to a reduction in its usage price, individuals would tend to reallocate their money and choose to use more public transport than private owned vehicle. It is, therefore, one can conclude that rational people would choose to forgo the type of transportation that they value less for the type of transportation that they value more.

LITERATURE REVIEW

Since the early development of literatures, WTP has been used as a tool to measure the values and the benefits of non-market goods and services given that it can accurately reflect the consumers' preferences. To our knowledge, WTP is initially used by the environmental economists to value the goods that are non-traded and without property rights such as air, water, forests and wildlife populations (Tietenberg & Lewis, 2008). To date, researchers from various disciplines have used it for policy planning purposes. For instance, Johnson *et al*. (2000), Wagner *et al*. (2000) and Milligan *et al*. (2010) used it to determine the values of health care, Steelman and Powell (1991) and Gertler and Glewwe (1992) used it to value education system, Davis and Tisdell (1999) and Kim *et al*. (2007) applied it as a tool to value the place of interest where tourists visit, Surendran and Sekar (2010) use it to study the forest eco-system, and Zarkin *et al*. (2000) and Cohen *et al*. (2004) used it to evaluate the drug abuse treatment and crime control programmes.

On top of that, WTP has also been used to measure the value of transportation related goods such as air and traffic noise pollution (Feitelson *et al*., 1996; Saelensminde, 1999; Bjoner, 2004; Fosgerau & Bjorner, 2006), improvement in transportation (Khattak *et al*., 2003; Molin & Timmermanns, 2006; Eboli & Mazzulla, 2008), improvement in road surface (Walton *et al*., 2004) and reduction in travel time (Calfee & Winston, 1998; Brownstone *et al*., 2003; Phanikumar & Maitra, 2007; Asensio & Matas, 2008; Takada & Fujiu, 2010).

Study by Brownstone *et al*. (2003), who investigated the determinants of WTP for a reduction in travel time in San Diego, found that women, middle age cohorts and those with higher income and higher education level are willing to pay more for faster transportation. Using toll fees as a proxy to measure individuals' WTP to avoid traffic congestion, Calfee and Winston (1998) observed that income is not significantly correlated with the value of travel time.

Senbil and Kitamura (2004), who explored the factors affecting WTP for expressways, suggested that females generally value the highway more than males. Markose *et al*. (2007) exhibited that higher income earners are willing to pay more to save their travelling time because of their greater opportunity cost, whereas, lower income earners are less responsive to the increasing cost of congestion. Brent (2006) and Carson (2000) indicated that individuals who are more aware of the environmental issues are more likely to use public transport.

Based on the case of Barcelona, Asensio and Matas (2008) found that males and those individuals with more children value their travel time more by using a more expensive but shorter alternative route. The study also revealed that older commuters are willing to pay more money to save their travel time. Phanikumar and Maitra (2007) examined the WTP for rural bus services and observed that socioeconomic factors such

as age, gender and income do not possess any significant impacts on the WTP for a reduction in travel time.

METHODS

Variables

Owing to the current lack of study on the WTP for public transport in Malaysia, the explanatory variables for present study are selected closely based on the previous studies that have been conducted elsewhere (e.g. Calfee & Winston, 1998; Brownstone *et al*., 2003; Phanikumar & Maitra, 2007; Asensio & Matas, 2008; Takada & Fujiu, 2010). To sum up, the explanatory variables of present study consist of age, gender, ethnicity, marital status, income, education, habit of using recyclable bags, experience in using urban rail-based transportation (e.g. monorail, MRT, LRT, Komuter), personal perspective on Malaysia public transportation system and problems of insufficient cark parks (Table 1).

Age of respondents is included in present study as a continuous variable, and it is hypothesised to have positive effect on the WTP for monorail. Respondents' gender is included as one of the dummy variable in present study, where males are represented by a value of 1 and females are represented by 0. Based on the findings of past studies, females are expected to have higher WTP for monorail than males.

Provided the homogeneous nature of the population in most of the countries, previous

TABLE 1
Definition of variables in the statistical model

Variables	Definitions
Dependent variable	
monorail	Willingness-to-pay for a trip of monorail to travel to work (RM)
Explanatory variables	
Age	Respondent's age in years
Male	Respondent is male
Malay*	Respondent is Malay
Chinese	Respondent is Chinese
Indian	Respondent is Indian/others
Single	Respondent is single
Low	Respondent's income is < RM 1000
Lower-mid	Respondent's income is RM 1000 – RM 2999
Upper-mid	Respondent's income is RM 3000 – RM 5999
High*	Respondent's income is > RM 5999
Tertiary	Respondent has tertiary education
Recycle	Respondent prefers to use recyclable bag than plastic bag
Experience	Respondent has the experience in using urban rail-based transportation
Efficient	Respondent thinks that the Malaysia public transportation system is efficient
Park	Respondent faces the insufficient cark park problems

*Note: *Refers to the reference groups*.

studies often do not take into account of ethnic variables. However, since Malaysia is well known for its uniqueness of multi-ethnic composition, respondent's ethnic background is taken into consideration in present study as three major groups (i.e. Malay, Chinese and Indian/others) to allow ethnic comparison. This is in light of the possible impacts of cultures, religions, racial-political and ethnic privileges on individuals' preferences for monorail. As emphasised by Ng *et al*. (2009), Chinese in Malaysia tend to face more barriers in economic advancement compared to Malays, thus they often engage in a hectic and fast-paced lifestyle in order to cope with their high cost of city living. For these reasons, Malaysian Chinese are expected to value monorail more than Malays given that monorail could ease their busy schedule.

Since the presence of children in a family may pose as a barrier to use monorail services as an alternative transportation to work as parents often need to provide transports for their children. Given the limited availability of data, present study uses marital status as a proxy to measure these family commitments, whereby, respondents who are single are coded as 1, and those who are married, divorcé or widow(er) are coded as 0. As such, it is anticipated that single individuals would have higher WTP for monorail than the married, divorcé and widow(er).

Following the guideline used by Cheah (2011) based on a sample of Penang, income variable is divided into four groups: low (< RM 1000), lower-middle (RM 1000 – RM 2999), upper-middle (RM 3000 – RM 5999) and high (> RM 5999). Based on the previous findings, it is hypothesised that higher income individuals would have higher WTP for monorail than the lower income individuals.

Present study uses a dummy variable to indicate respondent education background as 1 refers to the respondents who have at least tertiary education, 0 otherwise. Based on the previous studies, it is anticipated that individuals who have tertiary education are willing to pay more for monorail than those who without tertiary education.

In present study, respondents' recycling behaviour is used as a proxy to indicate their environmental awareness. Respondents who prefer to use recyclable material made bag than plastic bag are coded as 1, whereas those who do not have such preferences are coded as 0. The hypothesis is that individuals who have recycling behaviour would have higher WTP for monorail than those who do not have such behaviour.

Considering the possibility that familiarity with urban rail-based transportation may positively impact one's WTP for monorail, respondents who have the experience in using urban rail-based transportation is entered into the current model as 1, and 0 otherwise. Further, respondents' personal perspective on the Malaysia public transportation system is also included as a dummy variable in present study, given that it may be a determining factor of individuals' WTP for monorail. As such, if individuals think that the current public transportation system is efficient are

coded as 1, otherwise 0. It seems reasonable to anticipate that individuals who think that the current public transportation system is efficient would have higher WTP for monorail.

Last but not least, respondents who are currently facing the insufficient cark park problems in their residing areas or workplaces are denoted as 1, whereas those who are not facing such problems are indicated as 0. It is expected that car park issues in the residing areas or workplaces may affect individuals' preference for monorail. In particular, individuals who face the insufficient car park problems may have higher WTP for monorail than those who are not facing such problems.

Statistical analysis

By using the cross sectional survey data, a problem that occurs is the existence of zero amounts reported by large observations in the sample. Possible reason that arises may due to the lack of preference for the good and services. As such, application of ordinary least square (OLS) that does not take into account of such barriers for statistical analysis will definitely yield biased and inconsistent results (Maddala, 1983; Kang & Tan, 2004; Greene, 2007). It is therefore, to deal with such censored data (censored at the limit of zero expenditure), tobit model is suggested to be used (Tobin, 1958). In general, tobit model can be expressed as:

$$\begin{aligned} y_t &= X_t\beta + u_t \qquad \text{if } X_t\beta + u_t > 0 \\ &= 0 \qquad\qquad\quad \text{if } X_t\beta + u_t \le 0, \\ t &= 1, 2, ..., N \end{aligned} \tag{4}$$

where, y_t = WTP for a trip of monorail to travel to work (RM); X_t = explanatory variables that are hypothesised to affect the WTP for monorail; β = coefficients for the explanatory variables; u_t = error terms of the regression which assumed to be zero mean and constant variance $N(0,\sigma^2)$.

Data

Data used in present study was collected based on convenience sampling method. The survey was conducted at the selected manufacturing factories located in Bayan Lepas, Penang from February 2011 to April 2011. The inclusion criteria were those who were being employed full-time in the factories and had been residing in Penang for at least 12 months. Prepared questionnaires were distributed for self-administration by the respondents, despite, some explanations were provided upon giving out the questionnaires.

During the survey, several questions regarding the perspectives for monorail were addressed. In particular, respondents were asked to indicate whether they were willing to use monorail as an alternative transportation to travel to work, and how much they were willing to pay for a single trip. The targeted sample size was 508 respondents which represented 1611600 populations of Penang (SERI, 2011). The response rate was about 98% (498

respondents). Stata statistical software (version 9) was used to perform the statistical analysis.

RESULTS

The characteristic of survey respondents is presented in Table 2. Out of the total 498 respondents, 424 (85%) are willing to pay for a trip of monorail to travel to work, and 74 (15%) are not willing. The average amount of money that the respondents are willing to pay for a trip of monorail to travel to work is around RM 2, which is almost equivalent to the average price of monorail in Kuala Lumpur. Mean age of the respondents is approximately 31 years old. Approximately 47% of the respondents are male, and 50% are single.

Overall, the ethnic breakdown is as follows: 27% Malay, 61% Chinese and 12% Indian/others. Majority of the respondents are in the lower-middle income group (54%), followed by those in the upper-middle (32%), high (10%) and low (4%) income groups. A large proportion of the sample (78%) have tertiary education. About 87% of the respondents prefer to use recyclable material made bag than plastic bag. More than three-quarter (84%) of the respondents have the experience in using urban rail-based transportation. Only minority (33%) of the respondents think that

TABLE 2
Descriptive analysis of variables in the statistical model

Variables	Percentage or mean (SD)		
	Those who are willing to pay for monorail (n1 = 424)	Those who are not willing to pay for monorail (n2 = 74)	Total sample (N = 498)
Monorail	2 (2)	-	2 (2)
Age	31 (6)	31 (7)	31 (6)
Male	46	49	47
Malay	26	35	27
Chinese	61	58	61
Indian	13	7	12
Single	51	42	50
Low	4	4	4
Lower-mid	53	58	54
Upper-mid	33	27	32
High	10	11	10
Tertiary	80	68	78
Recycle	91	68	87
Experience	84	78	84
Efficient	35	22	33
Park	84	57	80

Note: For continuous variable, the value refers to mean, whereas for dummy variables, the value refers to percentage. SD refers to standard deviation.

the current Malaysia public transportation system is efficient. Last, around 80% of the respondents face the problems of insufficient cark parks in their residing areas or workplaces.

Estimation results for tobit analysis of WTP for monorail is summarised in Table 3. Correlation coefficients between income and education variables are calculated to detect the potential multicollinearity problem. The results show that the correlation coefficients between income and education variables are less than 0.8, thus indicating that there exists no multicollinearity problem in the current model (Studenmund, 2006) (Appendix 1). Further, Likelihood Ratio (LR) test is used to test the goodness-of-fit of the model. The LR chi-square with 13 degree of freedom has the value of 27.09, with the probability of 0.012. Hence, the null hypothesis can be rejected at 5% level, and conclude that the current model is very good fit.

The results show that only habit of recycling, experience in using urban rail-based transportation and problems of insufficient cark parks variables are statistically significant in affecting the individuals' WTP for monorail. Whereas, the rest of the variables like age, gender, ethnicity, income, education and personal

TABLE 3
Results for tobit analysis of WTP for monorail in Penang

Variables	Coefficient	Std. Err.	t-stat	p-value
	(1)	(2)	(3)	(4)
Constant	0.1175	1.0547	0.11	0.911
Age	-0.0008	0.0200	-0.04	0.970
Male	0.2954	0.1966	1.50	0.134
Malay	-	-	-	-
Chinese	0.1382	0.2402	0.58	0.565
Indian	0.2458	0.3349	0.73	0.463
Single	-0.0730	0.2314	-0.32	0.753
Low	-0.0229	0.6538	-0.03	0.972
Lower-mid	-0.3822	0.3912	-0.98	0.329
Upper-mid	-0.5022	0.3616	-1.39	0.166
High	-	-	-	-
Tertiary	0.3257	0.2826	1.15	0.250
Recycle	0.6220	0.3022	2.06	0.040**
Experience	0.4730	0.2771	1.71	0.088*
Efficient	0.3007	0.2120	1.42	0.157
Park	0.5965	0.2474	2.41	0.016**
LR χ^2 (13)	27.09			
P> χ^2	0.012			
Observations	497			

*Note: Asterisks *** indicate significance at the 1% level, ** at the 5% level, and * at the 10% level.*

perspective on Malaysia public transportation system are not significantly associated with individuals' WTP for monorail. In terms of environmental awareness factor, it is found that individuals who prefer to use recyclable material made bag than plastic bag are willing to pay RM 0.62 more for a trip of monorail to travel to work compared to their counterparts who do not have such awareness. Meanwhile, individuals who have the experience of using urban rail-based transportation are found to have RM 0.47 higher of WTP for a trip of monorail to travel to work in relative to their peers who do not have such experience. Further, individuals who face the problems of insufficient cark parks in their residing areas or workplaces are willing to pay RM 0.60 more for a trip of monorail to travel to work as compared to their peers who are not facing such problems.

DISCUSSION

Age is found to have no significant impact on the WTP for monorail. This observed outcome contradicts the studies by Brownstone *et al*. (2003), Asensio and Matas (2007) and Phanikumar and Maitral (2007), who claimed that age is able to affect one's preference for public transportation. Perhaps, this is due to the widely known facts that monorail transportation system in Malaysia is designed to be user friendly to both the elderly and youngsters. Therefore, the taste for monorail does not vary across the age of individuals.

Contrary to the arguments by Brownstone *et al*. (2003) and Senbil and Kitamura (2004), there are no gender differences in the preference for monorail. The reason may be that there exists an equal labour force participation rate between males (51%) and females (49%) in Malaysia, and thus somewhat indicating that both Malaysian males and females have the same likelihood of engaging in a busy working lifestyle (Department of Statistics Malaysia, 2010). It appears, therefore, one can conclude that Malaysian males and females may equally value their travel time in this urbanisation society.

It is surprising to observe that there is no significant relationship between ethnicity and the WTP for monorail. The absence of ethnic differences in present study may be because of the data that used in present study is unable to represent the ethnic Malays in Malaysia given that it consists of small proportion of Malay respondents (27%). It is worthwhile to note that marital status does not possess any significant impacts on one's WTP for monorail. Although single individuals do not have as much family commitments as those married, divorcé or widow(er), they equally appreciate their travel time. The reason may be that both of these groups of individuals utilise their time in a different manner. For instance, single individuals would often allocate most of their time for works, whereas, those who are non-single would tend to spend most of their time with their family.

Present study found that income is not significantly associated with the WTP for monorail. These unexpected outcomes contradict the previous arguments by

Brownstone *et al*. (2003), Markose *et al*. (2007) and Phanikumar and Maitra (2007). Based on these, one can conclude that opportunity cost of time does not play an important role in affecting individuals' decision to use time saving transportation such as monorail. In contrast to the findings by Brownstone *et al*. (2003), no significant relationship is found between education and the WTP for monorail. It may be because both education and income are complementary in nature. Hence, education per se does not possess any significant impacts on the WTP for monorail given that income is not significant.

With regard to the environmental awareness factor, individuals who have the habit of recycling such as using recyclable material made bag are observed to have a higher preference for monorail in relative to those who do not have such recycling habit. The fact of the matter is that monorail transportation is more environmental friendly as compared to automobile due to its low carbon emission system. Hence, those commuters who are more aware of the environmental issues would be more likely to use monorail as an alternative transportation to work.

Conform to the prior conjecture, individuals who have the experience of using urban rail-based transportation tend to value the monorail system more than their peers who do not have such experience. Two likely reasons exist for these findings. First, individuals who have the experience of using urban rail-based transportation are more familiar with the monorail system. Hence, they tend to find monorail easier to be used. Second, they are also more aware of the advantages of using monorail.

Contrary to the prior supposition, it is ascertained that individuals' perspective on the Malaysia public transportation system is not significantly correlated with the WTP for monorail. This may be mainly due to majority of the people in Penang have the confidence that the public transportations will improve substantially in the future. Based on these outcomes, one can reject the notion that people who do not think that the current public transportations system is efficient would not value the monorail.

In agreement with the earlier expectation, individuals who are currently faced with insufficient cark park problems in their residing areas or workplaces tend to place higher value on monorail. In other words, insufficient cark park problems pose as an incentive for one to use monorail. This is owing to use of urban rail-based transportation can ease the troubles in finding car parks.

CONCLUSION

The present study has shed new light on the determinants of WTP for monorail in Penang, Malaysia. Findings of present study appear to be very useful for the policy makers in designing the proper interventions for solving the problems of heavy traffic congestion. Specifically, the factors that found to be able to affect one's preference for using monorail include habit of recycling, experience in using urban rail-based transportation and the problems

of insufficient cark parks. Based on these findings, several policies are recommended.

First, environmental awareness programmes directed toward the public to increase the awareness of the risks of excessive carbon dioxide in the atmosphere may help reduce the traffic congestion in Penang. As a suggestion, these programmes should take into consideration of making environmental courses and seminars compulsory in the schools and workplaces to deliver the information about environmental issues. Nevertheless, efforts could also be made to invite the environmental specialists to become the spokespersons to highlight the alarming evidence of environmental pollution.

Second, policy makers are suggested to promote the benefits of monorail, such as less expensive, quicker and environmental friendly, to the community, with focus on those individuals who without the experience of using urban rail-based transportation. For instance, multi-lingual mass media such as newspaper, magazine, radio channels and television programmes could be used as the channel to deliver the messages regarding the benefits of monorail to the public. While, this is to guarantee the messages to reach a wider population.

Moreover, based on the economic interventions to discourage people from using private owned vehicle, government should consider imposing heavy parking fine in the areas where have a lot of illegal car parking. Government can thus use this collected revenue to further subside the public transportation system. As a result, rational individuals would be more likely to substitute monorail for private owned vehicle as the transport to travel to work during rush hours.

Given the budget, time and geographical constraints, several limitations are acknowledged in present study. First, the collected survey data is somewhat limited to adults who are working in the Bayan Lepas areas. Ideally, respondents travelling to/from work throughout the Penang Island as well as mainland should be canvassed in order to obtain a more representative sample. Others such as students and pensioners should also be examined for their travel patterns and preferences. Second, owing to a lack of measuring instrument, few variables that are deemed important are not taken into account in present study. For instance, the distance of travelling from house to workplace and the time spent in traffic congestion. As such, suggested future researches should not only be limited to the Bayan Lepas area. Since the city of Georgetown is facing heavy traffic issues during rush hours as well, the study should be extended to the whole of Penang island.

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REFERENCES

Asensio, J., & Matas, A. (2008). Commuters' valuation of travel time variability. *Transportation Research Part E, 44*(6), 1074-1085.

Bjorner, T. B. (2004). Combining socio-acoustic and contingent valuation surveys to value noise reduction. *Transportation Research Part D, 9*(5), 341-356.

Brent, R. J. (2006). *Applied cost-benefit analysis*, 2nd ed. Cheltenham, UK: Edward Elgar Publishing.

Brownstone, D., Ghosh, A., Golob, T. F., Kazimi, C., & Amelsfort D. V. (2003). Drivers' willingness-to-pay to reduce travel time: Evidence from the San Diego I-15 congestion pricing project. *Transportation Research Part A, 37*(4), 373-387.

Calfee, J., & Winston, C. (1998). The value of automobile travel time: Implications for congestion policy. *Journal of Public Economics, 69*(1), 83-102.

Carson, R. T. (2000). Contingent valuation: A user's guide. *Environmental Science & Technology, 34*(8), 1413-1418.

Cawley, J. (2004). An economic framework for understanding physical activity and eating behaviors. *American Journal of Preventive Medicine, 27*(3S), 117-125.

Cheah, Y. K. (2011). Influence of socio-demographic factors on physical activity participation in a sample of adults in Penang, Malaysia. *Malaysian Journal of Nutrition, 17*(3), 385-391.

Cohen, M. A., Rust, R. T., Steen, S., & Tidd, S. T. (2004). Willingness-to-pay for crime control programs. *Criminology, 42*(1), 89-110.

Davis, D., & Tisdell, C. A. (1999). Tourist levies and willingness to pay for a whale shark experience. *Tourism Economics, 5*(2), 161-174.

Department of Statistics Malaysia (2011). *Labour force statistics, Malaysia, 2010*. Department of Statistics Malaysia, Putrajaya.

Eboli, L., & Mazzulla, G. (2008). Willingness-to-pay of public transportation users for improvement in services quality. *European Transport, 38*, 107-118.

Feitelson, E., Hurd, R. E., & Mudge, R. R. (1996). The impact of airport noise on willingness to pay of residences. *Transportation Research Part D, 1*(1), 1-14.

Fosgerau, M., & Bjorner, T. B. (2006). Joint models for noise annoyance and willingness to pay for road noise reduction. *Transportation Research Part B, 40*(2), 164-178.

Gertler, P., & Glewwe, P. (1992). The willingness to pay for education for daughters in contrast to sons: Evidence from rural Peru. *World Bank Economic Review, 6*(1), 171-188.

Greene, W. H. (2007). *Econometric analysis*, 6th ed. NY: Prentice Hall.

Johnson, F. R., Banzhaf, M. R., & Desvousges, W. H. (2000). Willingness to pay for improved respiratory and cardiovascular health: A multiple-format, stated-preference approach. *Health Economics, 9*(4), 295-317.

Kang, S. H., & Tan, A. K. G. (2004). Determinants of domestic travel frequency: A preliminary analysis using Penang data. *Malaysian Journal of Economic Studies, 41*(1/2), 87-106.

Kaur, S. (2012). Improve public transportation in Penang. *The Star,* 10 April.

Khattak, A. J., Yim, Y., & Stalker Prokopy, L. (2003). Willingness to pay for travel information. *Transportation Research Part C, 11*(2), 137-159.

Kim, S. S., Wong, K. K. F., & Cho, M. (2007). Assessing the economic value of a world heritage site and willingness-to-pay determinants: A case of Changdeok Palace. *Tourism Management, 28*(1), 317-322.

Maddala, G. S. (1983). *Limited-dependent and qualitative variables in econometrics*, Cambridge: Cambridge University Press.

Markose, S., Alentorn, A., Koesrindartoto, D., Allen, P., Blythe, P., & Grosso, S. (2007). Smart market for passenger road transport (SMPRT) congestion: An application of computational mechanism design. *Journal of Economic Dynamic & Control, 31*(6), 2001-2032.

Milligan, M. A., Bohara, A. K., & Pagan, J. A. (2010). Assessing willingness to pay for cancer prevention. *International Journal of Health Care Finance and Economics, 10*(4), 301-314.

Molin, E. J. E., & Timmermanns, H. J. P. (2006). Traveler expectations and willingness-to-pay for Web-enable public transport information services. *Transportation Research Part C, 14*(2), 57-67.

Ng, K. M., Loy, J. T. C., Gudmunson, C. G., & Cheong, W. N. (2009). Gender differences in marital and life satisfaction among Chinese Malaysians. *Sex Roles, 60*(1-2), 33-43.

Phanikumar, C. V., & Maitra, B. (2007). Willingness-to-pay and preference heterogeneity for rural bus attributes. *Journal of Transportation Engineering, 133*(1), 62-69.

Saelensminde, K. (1999). Stated choice valuation of urban traffic air pollution and noise. *Transportation Research Part D, 4*(1), 13-27.

Senbil, M., & Kitamura, R. (2004). Willingness-to-pay for expressways. *International Conference Experiments in Economic Science: New Approach to Solving Real world Problems*. Okayama and Tokyo.

SERI (Socioeconomic & Environmental Research Institute) (2011). Population. http://penanginstitute.org/v3/resources/data-centre/122-population

Steelman, L. C., & Powell, B. (1991). Sponsoring the next generation: Parental willingness to pay for higher education. *American Journal of Sociology, 96*(6), 1505-1529.

Studenmund, A. H. (2006). *Using econometrics: A practical guide*, 5th ed. NY: Pearson.

Surendran, A., & Sekar, C. (2010). An economic analysis of willingness to pay (WTP) for conserving the biodiversity. *International Journal of Social Economics, 37*(8), 637-648.

Takada, K., & Fujiu, M. (2010). Study of willingness to pay for reducing lost time of railway users. *Journal of the Eastern Asia Society for Transportation Studies, 8*, 1464-1474.

Tan, S. C. (2010). Penang's capital is eighth most liveable city in Asia, on par with KL and Bangkok. *The Star*, 23 May.

The Star (2011). Number of vehicle registered on the rise. *The Star,* 26 Feb.

Tietenberg, T., & Lewis, L. (2008). *Environmental and natural resource economics*, 8th ed. USA: Pearson Education.

Tobin, J. (1958). Estimation of relationships for limited dependent variables. *Econometrica, 26*(1), 24–36.

Wagner, T. H., Hu, T. W., Duenas, G. V., & Pasick, R. J. (2000). Willingness to pay for mammography: Item development and testing among five ethnic groups. *Health Policy, 53*(2), 105-121.

Walton, D., Thomas, J. A., & Cenek, P. D. (2004). Self and others' willingness to pay for improvements to the paved road surface. *Transportation Research Part A, 38*(7), 483-494.

Yeoh, W. (2011). Timely feature on Penang as a choice MNC destination. *The Star*, 23 April.

Zarkin, G. A., Cates, S. C., & Bala, M. V. (2000). Estimating the willingness to pay for drug abuse treatment: A pilot study. *Journal of Substance Abuse Treatment, 18*(2), 149-159.

APPENDIX

CORRELATION COEFFICIENT BETWEEN INCOME AND EDUCATION VARIABLES

Variables	Low	Lower-mid	Upper-mid	High
Tertiary	-0.3349 (0.000)***	-0.1222 (0.006)***	0.1985 (0.000)***	0.1135 (0.011)**

Note: P-value in parentheses. Asterisks *** indicate significance at the 1% level, ** at the 5% level, and * at the 10% level.