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Factors Affecting Consumer Attitude toward the Use of Eco-car Vehicles

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Abstract

Increasing in oil prices and critical condition in climate changes have put the pressure on the evolution of energy saving automobiles. Thai government has launched the policy to induce car users to switch to use eco-cars. However, according to the energy saving condition, capability of eco-car is limited to some certain level. With this limitation, car users might perceive eco-cars as inferior. This study emphasizes on car users' attitude toward eco-cars and factors that influence their attitude as well as the chance of using eco-cars. Sample of 560 respondents of car users in Bangkok, Thailand is collected and analyzed using multivariate analysis. Linear regression and Generalized Linear Model assuming Logit are employed in analyzing factor determining attitude toward eco-cars. Linear regression model and Ordered Logit model are applied in determining factor influencing chance of using eco-cars. The results confirm the hypothesis that attitude of car users on eco-cars plays an important role in determine decision of using eco-cars. Thus, Thai government should not only promote eco-cars through the low price and energy saving incentive policies but also the policy to change the car users' attitude toward eco-cars.

Keywords – Attitude toward eco-cars; Generalized Linear Model (GLM); Ordered Logit Model; Energy saving product.

1. Introduction

Climate change and its anthropologic character are widely demonstrated within the scientific community. Emissions of the Green House Gas (GHG) and carbon dioxide (CO_2) from automobile now become environmental concerns in many countries. Burning fossil fuels is one major cause of this problem. Since most modes of transportation require burning of fossil fuels, the transport sector is one of the main emitter of CO_2. According to this circumstance, car manufactures nowadays have been inventing vehicles that consume less gasoline and emit less pollution per mile in order to respond to the pressure of polluting the environment (Achtnicht, 2009; Gallagher & Muehlegger, 2011).

As a consequence of the increasing price of petroleum, Thai governments have made an effort to diminish this problem by supporting eco-car (small-size and energy-saving car) project since 2006. Its

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goals are not only producing eco-car for domestic use but also for an export base of regional and global markets. Accelerated domestic adoption of alternative-energy vehicle technology plays an important role in both energy and environmental saving (Gallagher & Muehlegger, 2011).

Although manufacturing and the using of eco-car endorsement help reducing petrol domestic consumption, the eco-car performances are less powerful than those of the typical normal cars. Concerning on both performance and safety of an eco-car simultaneously might lower the interest of the car users. Therefore, the purpose of this paper aims at determining the factors influencing the attitudes of consumers towards eco-cars and their decision on using eco-cars.

2. Theoretical Framework

2.1. Factors Influencing Attitudes towards Eco-cars

A large number of study on green or ecological products found that consumers who concern more on environmentally friendly are more likely to be the high level of education group, Reizenstein, Hill and Philpot (1974) found that only men adopted to pay more for green products, while Anderson et al. (1972) found women. Not only education and gender, but income and age also have influence on decision to use the green products. Rice, Wongtada, and Leelakulthanit (1996) claimed that younger consumers have more concerns on environmentally friendly products than older consumers.

However, the contradict relationships have also been argued by some other scholars. For example, Shamdasani, Chon-Lin, & Richmond (1993) did not find demographic differences between greens and non-greens. Rice, et al. (1996) claimed that knowledge and values also have impacts on attitude toward environmental friendly. According to the finding of the relationship between attitude and behaviour, consumers normally behave with the attempt to protect the environment. Consumers will try to protect the environment in different ways, such as purchasing only green product. Loudon and Della Bitta (1993) stated that the function among behavioural change, behavioural intentions, and attitudes.

Hini, Gendall and Kearns (1995) found the significant linkage between attitudes and behaviour even though the strength of the relationship was very weak. The low correspondence between attitudes and behaviour may be caused by the reason that the attitudes and behaviour are not measured at similar levels of specificity (Dobson, 2007). Young, Hwang, McDonald and Oates (2010) named this so called finding as "attitude-behaviour gap."

According to the above statement, the first hypothesis can be stated as:

H_1: Personal factors (gender, age, status, occupation, education, salary) and car usage behaviour (car types, fuel expenditure, gasoline types, and energy conservation) have influence on the attitudes of consumers towards eco-cars.

2.2. Factors Determining Decision on Using Eco-cars.

Lane and Potter (2007) claimed that the situational and psychological factors have significant impacts on the car-purchasing behaviour of both private motorists and fleet buyers. The situational factors include economic and regulatory environment situations, vehicle performance and application situation, and the existing fuel/road infrastructure situation. Choo and Mokhtarian (2004) also empirically found that the psychological factors, including, the private motorists' attitudes, lifestyle, personality and self-image, have significant impacts on decision on using eco-cars. In regard with the fleet purchasers, risk-perception, corporate culture, and company image must be taken into account.

Attitude-action gap shows that consumers' concern for environmental impact seldom transform into behavioural change. People tend to be more concerned about status value and less about environmental performance than they expected (Chen et al. 2010). This would be compatible with the celebrated claim made by policy makers and car-producers which said that 'consumers are just not interested in environmentally-friendly cars (Nijhuis and van den Burg 2007).

Studies concerning on environmental and eco-cars mostly focused on the consumer incentive and their purchasing behaviour. Achtnitch (2009) have found that women, people under age of 45 years, and people who possess a higher education have more willingness to pay on reduction in CO_2 emissions. Mass media has affected to consumers on environmental, economic, and driving features since it has mentioned about their comparison of the price with the car's performance and the fact about the environmental quality (Kanai, 2004). Gallagher and Muehlegger (2011) mentioned that gasoline prices are positively correlated with energy-saving vehicle sales (such as hybrid-car vehicles).

Many studies in Thailand have discovered that the most important factor which determines consumers' decision in purchasing a new vehicle is petrol conservation (e.g., Siripoke 2006; Syekam

2009). The consumers that concern fuel economy are more likely to be female, single, students, government official and public employees (Syekam 2009). However, Siripoke (2006) did not find the demographic differences between energy concern and non-energy concern.

According to the above mentioned variables, the second hypothesis can be stated as:

H_2: Personal factors (gender, age, status, occupation, education, and salary), car usage behaviour (car types, fuel expenditure, gasoline types, energy conservation) and attitudes of consumers toward eco-cars (positive and negative attitudes) influence decision to use eco-cars.

3. Methodology

3.1. Factor Influencing Attitude toward Eco-cars

Sample includes 560 respondents which randomly observed from car users in Bangkok, Thailand. Data is analyzed by employing multivariate statistical analysis using regression model.

$$Attitude = \beta_0 + \beta_1 Female + \beta_2 Married + \beta_3 Education + \beta_4 Income + \beta_5 Age + \beta_6 Occupation + \beta_7 Car + \beta_8 FuelExpenses + \beta_9 GasType + \beta_{10} EnergySave + u_1 \quad (1)$$

where: dependent variables are positive attitude and negative attitude. Positive Attitude is positive attitude toward eco-car has value range between 0 and 1 which means 100% positive attitude. Negative Attitude is negative attitude toward eco-car has value range between 0 and 1 which means 100% negative attitude. Female is dummy variable for gender equal to 1 for female or 0 for male. Married is dummy variable for marital status equal to 1 for married or devoted or 0 for single. Education is dummy variable for education equal to 1 for higher than bachelor degree graduate or 0 otherwise. Income is dummy variable for income equal to 1 for income higher than 40,000 baht per month or 0 otherwise. Age is dummy variable for age equal to 1 for age older than 30 years old or 0 for 30 years old or younger. Occupation is dummy variable for occupation equal to 1 for government agent or 0 otherwise. Car is dummy variable for type of car equal to 1 for car with engine larger than 1,800 cc. or 0 otherwise. Fuel Expenses is dummy variable for fuel expenses on car equal to 1 for spending more than 10,000 baht/month or 0 otherwise. Gas Type is dummy variable for gas type equal to 1 for car using gas LPG or NGV or 0 otherwise. Energy Save is dummy variable for energy save concern equals to 1 for driver with energy save concern and 0 otherwise.u_1 is disturbance term and assumed to be normally distributed with zero mean and constant variance.

Since attitude toward eco-cars are measured as percentage range from 0 to 1, the dependent variables are variables with the upper bound equal to 1 and lower bound equal to 0. The linear regression model might not be an appropriated, thus, this study employs Generalized Linear Model (GLM) assuming Logit model.

3.2. Factors Determining Decision to Use Eco-cars

Decision to use eco-cars is analysed by employing the following regression model.

$$Y = \beta_0 + \beta_1 Female + \beta_2 Married + \beta_3 Education + \beta_4 Income + \beta_5 Age + \beta_6 Occupation + \beta_7 Car + \beta_8 FuelExpenses + \beta_9 GasType + \beta_{10} EnergSave + \beta_{11} PositiveAtt + \beta_{12} NegativeAtt + u_2 \quad (2)$$

where: dependent variable (Y) is opportunity of using eco-cars equal to zero for no chance (0%), one for 1-25% chance, two for 26-49%, three for 50%, four for 51-75%, and five for higher than 75%. Positive Att is positive attitude of car drivers toward eco-car has value range between 0 and 1 which means 100% positive attitude. Negative Att is negative attitude of car drivers toward eco-car has value range between 0 and 1 which means 100% negative attitude. u_2 is disturbance term and assumed to be normally distributed with zero mean and constant variance.

However, since the dependent variable, opportunity of using eco-cars, is discrete number and has the value either 0, 1, 2, 3, 4, or 5, the linear regression model might be inappropriate. Therefore, this study employ Ordered Logit model in analyzing opportunity of using eco-cars.

4. Empirical Result

Table 1 reveals the estimated results of attitude towards eco-car. The results from both linear regression models and GLM confirmed that occupation has significant impact only on positive attitude

but no impact on negative attitude. The type of car does not have significant with positive attitude but significant with negative attitude. Fuel expenditure per month, and energy saving have significant impact on positive attitude but no impact on negative attitude. The results indicate that occupation, fuel expenditure per month, and energy saving have significant impacts on positive attitude while only type of car has significant impact on negative attitude.

Table 1 Estimated Results of Attitude towards Eco-car using Linear Regression Models

	Positive Attitudes		Negative Attitude	
Variable	**Linear**	**GLM**	**Linear**	**GLM**
Occupation	0.0794***	0.2854*		
Car			0.0483***	0.2076***
Fuel Expenses	-0.0990***	-0.3823***		
Energy Save	0.0463**	0.2751***		
Constant	0.6860***	0.8434***	0.5006***	0.0069
F	13.546***	8.2100***	12.623***	12.067***
R^2	0.0681	0.0441	0.0221	0.0213
RSS	18.699	503.67	10.449	200.68
ll	157.24	-745.65	320.20	-506.05

where: * is statistical significant at 0.1** is statistical significant at 0.05*** is statistical significant at 0.01

Table 2 Estimated Results of Chance of Using Eco-car

	Linear	**Order Logit**
Age	-0.3604**	-0.5350**
Occupation	-0.2559*	-0.3153*
Car	-0.2365*	-0.3216*
Fuel Expenses	0.2521*	0.3141*
Gas Type	0.4323***	0.5920***
Energy Save	0.1663*	0.2872*
Positive Att.	1.7832***	2.5280***
Negative Att.	-1.9577***	-2.7809***
Constant	0.9626***	
Cut1		-0.3608
Cut2		1.1024***
Cut3		1.9784***
Cut4		3.4354***
Cut5		4.8006***
F-test	12.6246***	
Chi^2		95.5497***
R^2	0.1549	
ll	-929.71	-890.41

Where: * is statistical significant at 0.1** is statistical significant at 0.05*** is statistical significant at 0.01

Employing both linear and Ordered Logit models, the estimated results of the models for chance of using eco-car are shown in Table 2. Age, occupation, type of car, gasoline type, positive attitude, and negative attitude have significant impacts on chance of using eco-cars while gender, marital status, education, income per month, fuel expense per month, and energy saving of the car have insignificant impact. The results have also been confirmed that age, occupation, type of car, fuel expenditure per month, gasoline type, car's energy saving, and both positive and negative attitude have significant impacts on the chance of using eco-cars.

5. Discussion

Research finding partially support the first hypothesis of the study that personal factors (gender, age, status, occupation, education, and salary) and car usage behaviour (car types, fuel expenditure, gasoline types, and energy conservation) have influence on the attitudes of consumers towards eco-cars. Age, personal income, and occupation are related positively to the usage of ecology environmentally friendly cars consistence with the conclusion of Achtnitch (2009) and Rice et al. (1996). However, the finding indicated that gender and education are insignificant factor that determine attitude toward eco-cars, which is contrast with Achtnitch (2009) and Rice et al. (1996).

The finding also reveals that the larger capability (measured by cc.) of the car the respondents use, the higher the negative attitude change toward eco-cars they have. Kanai (2004) also explained that

performance of the car is one major factor that determines attitude of the customer toward buying a car. Consistent with the study results of Gallagher & Muehlegger (2011), this study found that gasoline price significantly relate with energy-saving vehicles. The results indicate that the less amount of fuel expenditure per month the car user spends, the higher level of positive attitude towards eco-cars they have. Additionally, the findings also found that the car users with higher positive attitude are more likely to use eco-cars than the negative attitude users.

The estimated results support the second hypothesis. Personal factors and car usage behavior and attitudes of consumers toward eco-cars have significant influence on decision to use eco-cars. The factors that have significant impacts on the attitude toward eco-cars include age, occupation, monthly personal income, type of car, monthly fuel expenditure, gasoline type, and cars' energy saving. Accordingly, these factors are significant determinants of the chance of using eco-cars with the additional factors, which are positive and negative attitudes. These findings support the results of Lane and Potter (2007) that fuel consumption of the car is one major factor that influence the decision on buying a car – the lesser the fuel consumption of the car is, the higher chance of buying a car it will be.

This study only concern with individual factors towards eco-cars and personally chance of using them without any government policy intervention or subsidy – for example tax-subsidy or tax-refund policy. It would be interesting to investigate whether government policy can help stimulate or changing car users' behaviour of using eco-cars. Thus, further studies should also focus on the impacts of tax incentive or government policies on attitude towards eco-cars and chance of using them.

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