Original Article

Self-reported inclination of heavy-duty vehicle drivers to adopt eco-driving in different motivation contexts

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Abstract

Eco-driving is an emerging field of research. Due to its positive dimensions on fuel-economy and environmental emissions, it is becoming a well-known concept in transportation industry. Behavioral responses of drivers' readiness to adopt eco-driving are studied. Questionnaires are collected from 87 truck drivers working for a logistics firm in Thailand. Eco-driving was introduced using three different strategies; changing driving behavior, competition with fellow drivers, and reward or penalty systems. A five-point Likert scaling system is adopted to record their self-evaluation scoring to practice eco-driving in given contextual motivations. Results are reported in the form of eco-driving scores and Statistical evaluations to check if the difference in behavioral response is statistically significant. Statistically significantly different results showed that in-relationship (score 3.75) and high school drivers (score 4.38) manifested strong motivations in penalty or reward systems while high school drivers exhibited great inclinations in changing their driving behavior (score 3.89).

Keywords: co-driving, Thai drivers, co-driving score, behavioral response, motivation contexts

1. Introduction

The consumption of fuel in the transportation sector has increased drastically in recent decades. According to estimation, the daily fuel consumption by transportation sector is expected to reach 60 million barrels in 2035 amounting 61% of the total fuel production. This rising demand of fuel will continue to increase even with advances in technology (Ma, Xie, Huang, & Xiong, 2015). The higher prices of fuel in transport operations have compelled logistics firms to investigate either ways of fuel-saving. Drivers are important components in logistics operations as they are co-responsible of high fuel-consumption. To diminish the menaces of fuel-costs many companies around the globe have started to engage their drivers in minimizing these intimidations. One of the

strategy to reduce these perils is to encourage drivers to act economically and ecologically attractive drivers by practicing eco-driving behaviors (Xu, Li, Liu, Rodgers, & Guensler, 2017). A Colombian case study identified key factors which are influential to fuel-consumption and investigated that a substantial amount of 6.8% (l/t-100 km) of fuel can be saved through eco-driving training campaign (Díaz-Ramirez et al., 2017). Eco-driving includes the strategic, tactical and operational decisions a driver can make to improve the fuel-economy of vehicles. Strategic decisions include the selection of a vehicle type, vehicle model, vehicle maintenance strategies, tires inflation pressures, and engine oil choices which may directly or indirectly affect operational costs and its subsequent impacts on fuel-economy. Tactical decisions incorporate selection of routes, road grades, and congestion conditions. While, operational decisions include vehicle engine idle timings, speed patterns, and use of electrical appliances (i.e., air-conditioning etc.) that affect fuel-economy (Sivak & Schoettle, 2012). Table 1 shows some of factors that affect fuel-economy.

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Table 1.   Summary of the factors affecting fuel economy (Sivak & Schoettle, 2012).

Factor	Effect on fuel-consumption
Vehicle type	38%
Out-of-tune engine	4-40%
Tires with 25% higher rolling resistance	3-5%
Tires underinflated by 5 psi	1.50%
Improper engine oil	1-2%
Route type	Variable
Road grade profile	15-20%
Congestion condition	20-40%
Engine idling	Variable
Driving at high speeds	30%
Not obeying cruise control	7%
Using air-conditioner	5-25%
Aggressive driving	20-30%

Eco-driving is a cheaper option among the available alternatives in reducing fuel-consumption (Ayyildiz, Caval laro, Nocera, & Willenbrock, 2017). Different researcher have discussed the benefits and different strategies of eco-driving owing to its positive dimensions on fuel-economy (fuel-saving 5-25%; average 10%) (Alam & McNabola, 2014; Dogan, Steg, & Delhomme, 2011; Lai, 2015; Larsson & Ericsson, 2009; Linda & Manic, 2012; Rolim, Baptista, Duarte, Farias, & Shiftan, 2014; Schall & Mohnen, 2015, 2017; Zhao, Wu, Rong, & Zhang, 2015) and environment (McIlroy & Stanton, 2017; Mensing, Bideaux, Trigui, Ribet, & Jeanneret, 2014; Pampel, Jamson, Hibberd, & Barnard, 2015; Rolim et al., 2014; Schall & Mohnen, 2015, 2017; Sivak & Schoettle, 2012; Van Mierlo, Maggetto, Van de Burgwal, & Gense, 2004; Wu, Zhao, Rong, & Zhang, 2018; Xu et al., 2017). However, very limited number of studies have been conducted in order to know the understandings of the drivers as eco-drivers (Dogan et al., 2011; Lauper, Moser, Fischer, Matthies, & Kaufmann-hayoz, 2015; McIlroy & Stanton, 2017; Nègre & Delhomme, 2017; Pampel et al., 2015). These studies discussed different aspects of eco-driving in different manifestations. For example, Dogan et al. (2011) investigated the goals of drivers on safety, time saving and fuel saving; McIlroy & Stanton (2017) used an online questionnaire survey to know the knowledge and understanding of UK drivers of eco-driving based on their demographic features; while, Nègre & Delhomme (2017) discussed French drivers' self-perception of being eco-driver according to their concern for environment, understanding of their eco-driving concepts, and their driving behaviors. According to the authors' knowledge there is great need to know the self-reported inclination of drivers to adopt eco-driving styles in three different contexts (i.e., changing driving styles, competition with fellow colleague drivers, and impacts of penalty or reward system) to practice eco-driving after getting the proper knowledge and understanding of eco-driving practices, guidelines and rules especially in Thailand.

The remainder of the paper is divided into following sections; section 2 describes the methodology followed which is further split up in three subsections (i.e., participants, procedure, and measures), section 3 discusses the results in the form of eco-driving scores and statistical reports, section 4 includes the discussions of the results, limitations of the study, future research questions and possible directions for conti-

nuation of this study. In the last part, section 5 acknowledgement is given to all the parties who helped in making this research possible.

1.1. Research hypothesis

Pampel *et al.* (2015) described the participant drivers' behaviors and thoughts in three different situations (i.e., drives normally, drive safely, and drive fuel-efficiently) in a driving simulator experiment and reported that drivers do not follow these driving styles called mental models when they are asked to drive normally (in eco-driving manner). In this study, it is hypothesized that each driver group will show varying manifestations on their inclination to adopt eco-driving according to their demographic profile (i.e., marital status, education level, age, and driving experience). It is also hypothesized that different motivations of changing driving behaviors, competition with fellow drivers and penalty or reward contexts to practice eco-driving will have different impacts on similar group of drivers.

2. Methodology

In this study, the behavioral response of Thai drivers using a questionnaire survey form has been recorded. A five-point Likert scaling system is used, ranging from one (1) strongly disagree to five (5) strongly agree. Five-point Likert scaling system has been used by previous researchers for similar kind of studies to investigate the behavioral response of drivers (Martin, Chan, & Shaheen, 2012; Nègre & Delhomme, 2017; Sullman, Dorn, & Niemi, 2015). Different statistical techniques are employed by checking the applicability of testing method to observe the difference in behavioral response if it is statistically significant or not according to defined groups of Thai drivers with respect to their demographic profile in three given contextual motivations.

2.1 Participants

The heavy-duty vehicle drivers were included in this study from one of the largest logistics firm in Thailand. Overall, we got a very positive response due to the involvement of local Thai undergraduate students from Thammasat University and company administration. Also, each participant driver was offered a free ice-cream as a bonus for encouraging them to fill their response cautiously. The demographic features of the drivers were also recorded through questionnaire survey form.

As shown in Table 2, drivers were categorized into three groups with respect to their marital status such as; single, married and in-relationship drivers. While, the categorization based on education was made according to the standard levels of education system in Thailand as; primary schooling, secondary schooling, high schooling, and university level education. Drivers were divided into three different groups with respect to their age such as; less than 30 years, 30-50 years, and more than 50 years old. In the same way, division according to driving experience was; less than 5 years, 5-10 years, and more than 10 years. There were total of eighty-seven (87) drivers engaged in filling the questionnaire survey form. There were eighty-six (86) male drivers while

only one (1) female driver in the company. That's why the impact of gender is not studied in this research. Their division by each group is shown in Table 2.

2.2 Procedure

Four meeting between the researchers, company management and drivers were arranged during the study period. In these meetings, the researchers gave some idea about the purpose of the research and preliminary analysis methods. To be able to get the response of the exact nature, the questionnaire was translated both into Thai as well as English languages. Also, drivers were given briefings about eco-driving styles before they were given with the questionnaire forms and during the questionnaire fillings undergraduate students were deployed in case if a driver don't understand any question or have to ask anything related with questionnaire. The questionnaire form was divided into four sections. In the first section, the drivers were asked to provide information about their demographic features such as; gender, marital status, education, age, and driving experience. Next three sections were dedicated to three different motivation contexts of changing driving behaviors, competition with fellow drivers, and impacts of penalty or reward systems on their behavior to adopt eco-driving behavior, respectively. It takes around half day in recording the response of the drivers, as they were on two-shifts and they were asked to fill the questionnaire before they leave for their homes. The average time in filling the questionnaire form was 20 minutes and each driver was offered ice-cream as a bonus for his participation.

2.3 Measures

This study was conducted as a part of company's policy to promote eco-driving behaviors among its fleet drivers. That's why the drivers were asked to score their inclinations in three contextual eco-driving techniques; changing driving behavior, competition with fellow drivers, and penalty or reward system. So, this study manifested inclinations of heavy-duty vehicle drivers to score themselves against different eco-driving techniques. In order to get the response of the drivers to adopt eco-driving in different motivations; the questions in the questionnaire were included very carefully. It is important to mention that drivers were properly informed about the reward and penalty systems to be introduced by the company. Five-point Likert scaling system

was used to record the response against each section included. In the first section, demographic features responses were recorded in the questionnaire.

Changing driving styles (S1); The second part of the questionnaire includes the questions related with the willingness of the heavy-duty vehicle drivers to change their existing driving behavior according to eco-driving styles within the domain of the instructions and guidelines provided about eco-driving. The complete set of questions included in this particular eco-driving motivation is as follows:

- ☐ Are you willing to take a longer route with less traffic instead of shorter route with more traffic to avoid congestion and saving fuel?
- ☐ Do you think your driving behavior should be changed according to company's policy of saving fuel?
- ☐ Are you willing to follow driving limitations imposed by your company?
- ☐ Are you willing to change your driving behavior if you are given some extra privileges for economical driving?
- ☐ Are you ready to change your existing driving behavior to eco-driving behavior?
- ☐ Are you ready to follow instructions and guidelines set by the company for eco-driving?
- ☐ Do you think your current driving style is not okay and you need to improve it?
- ☐ Do you think eco-driving will make you a better driver?

Competition with fellow drivers (S2); The next part of the questionnaire was about to record their manifestations to adopt eco-driving styles according to the knowledge and understanding of eco-driving in accordance with instructions provided. Their response was recorded in compliance with adopting eco-driving style while in competition environments. The following questions were the part of the questionnaire to measure their manifestations in this particular motivation:

- ☐ Do you want that company should approve a competition system to encourage best performance of drivers?
- ☐ Do you think in competition with other drivers will make you more efficient driver?
- ☐ Do you think engaging drivers in competition to drive more economically will improve the system?
- ☐ Do you think that scoring drivers based on their performance will improve eco-driving behaviors?

Table 2.   Demographic features of participant drivers.

Variable	No. of participants	%	Variable	No. of participants	%
Gender			High school	20	22.99
Male	86	98.85	University level	3	3.45
Female	1	1.15	Age		
Marital status			<30	9	10.34
Single	21	24.14	30 - 50	73	83.91
Married	54	62.07	>50	9	10.34
In relationship	12	13.79	Driving Experience		
Education level			<5	15	17.24
Primary school	21	24.14	5 - 10	45	51.72
Secondary school	43	49.43	>10	27	31.03 31.04

☐ Would you like that the company should introduce a performance measure system to promote eco-driving behaviors?

Penalty or reward systems (S3); The last part of the questionnaire included questions related with penalty or reward contexts. The following questions were the part of this particular motivation context:

☐ Do you think on poor driving you're ready to receive written warnings?

☐ Do you want company to introduce a monetary reward system to encourage eco-driving?

☐ Do you think poor driving leading to firing from job is justifiable?

☐ Do you agree that contract agreements made for the continuation of job will be made based on driving performance scoring system?

☐ Do you think, company's policy of penalty and reward system is justified?

3. Results

The results are reported in the form of eco-driving scores on the scale of five showing the willingness of drivers to adopt eco-driving in given motivations. Also, statistical analysis (i.e., *Pearson correlations*, ANOVA and *post-hoc* comparison testing) is carried out to find the combination of best motivations which have greater impacts on their behavioral response to practice eco-driving and to check if difference in behavioral responses is statistically significant or not. However, it is much important to note that ANOVA and *post-hoc* comparison testing is performed on individual scores by each participant against each motivational context.

3.1 Eco-driving scores and statistical analysis

The results of the intentional response of drivers to adopt eco-driving in three given motivations of changing driving style according to eco-driving, in competition with fellow drivers, and impacts of penalty or reward system on their behavioral response were recorded. Drivers were allowed to score their motivations in each context according to their understanding and knowledge of eco-driving. *Pearson correlations* of different motivation contexts are described followed by eco-driving scores, ANOVA and *post-hoc* comparison testing.

As it can be seen from Table 3, a very high positive correlation between penalty or reward system and competition

Table 3.   Pearson Correlation between different motivations of adopting eco-driving.

	Changing driving behavior	Competition with drivers	Penalty or reward system
Changing driving behavior	1.00		
Competition with drivers	0.42	1.00	
Penalty or reward system	0.57	0.79	1.00

with fellow drivers is of special interest of seventy-nine (79%) percent. Thus, we can isolate the idea that drivers who are interested in penalty or reward system are also very much interested in competition with colleague drivers to practice eco-driving. Which shows that the drivers who are interested in penalty or reward contexts, also show strong motivation to be in competition with fellow drivers in adopting eco-driving styles. Similarly, the drivers who show strong motivations to be in competition with fellow drivers are least correlated of forty-two (42%) percent in the given contexts with drivers who want to change their driving behavior in becoming eco-drivers. The drivers who are interested in penalty or reward contexts and drivers who want to change their driving behavior showed a positive correlation of fifty-seven (57%) percent.

After checking the application condition of ANOVA testing, the analysis is carried out to check that the behavioral response by different driver groups subject to the variables of marital status, education levels, age and driving experience is statistically significant or not in given motivations. Subsequently, the applicability of the *post-hoc* comparison testing is also checked to further observe if the difference in behavioral response by each motivation type is statistically significant or not according to the profile of the drivers. The significance level (denoted as α or alpha) is set to 0.05 for carrying out these testing.

These results are the self-scored inclination of Thai drivers to practice eco-driving in given motivations. The details of each driver group; global score, mean score in each context, and standard deviations according to their profile are shown in Table 4.

Global scores are the summation of the overall mean scores of drivers in each motivation context. Apparently, single drivers reported the frequency of adopting eco-driving

Table 4.   The global score, mean score, and standard deviations of Thai drivers' inclination to adopt eco-driving behavior score.

	Marital status			Education level				Age (years)			Driving Experience		
	Single	Married	In relationship	Primary school	Secondary school	High school	University level	< 30	30-50	> 50	< 5	5-10	> 10
Global score	12.07	11.77	10.51	11.65	11.14	12.78	12.33	12.00	11.71	12.42	11.80	12.17	11.56
Changing driving behavior	4.21	4.00	3.63	4.00	3.89	4.01	4.13	4.27	3.92	4.36	4.12	3.95	3.96
Competition with fellow drivers	3.81	3.79	3.12	3.74	3.49	4.39	3.93	3.60	3.81	3.93	3.72	4.04	3.68
Penalty or reward system	4.05	3.98	3.75	3.92	3.75	4.38	4.27	4.13	3.98	4.13	3.96	4.18	3.91

styles more easily in almost each motivation context as compared with married and in relationship drivers. To be more precise, they are very much interested in changing their driving behavior as eco-driver (score 4.21) and penalty or reward system (score 4.05) (Table 4) (Figure 1). However, the One-factor testing results showed that the difference in behavioral response of single drivers in given three motivation contexts is not statistically significant [F (2,60) = 3.0097, *p-value* = 0.0569, F_{crit} = 3.150]. As the difference is not statistically significant so *post-hoc* comparison testing is ignored. Similarly, the intentional behavioral difference of married drivers in given motivations was also not statistically significant [F (2,168) = 2.491, *p-value* = 0.085, F_{crit} = 3.049]. Again, *post-hoc* comparison testing was not applicable to further investigate the difference in behavioral response. However, it was found that in-relationship drivers reported significantly different in given motivations of changing driving behavior, competition with fellow drivers and impacts of penalty and reward systems to adopt eco-driving practices [F (2,36) = 4.653, *p-value* = 0.01594, F_{crit} = 3.2594]. So, it was further investigated via *post-hoc* comparison testing to check which type of motivation works best specifically. It was found that the difference in behavioral response of in-relationship drivers in changing driving behavior (score 3.63) and competition with fellow drivers (score 3.12) was statistically significantly different (*p-value* = 0.0133). Similarly, intentional behavior between competition with fellow drivers (score 3.12) and impacts of penalty and reward systems (score 3.75) motivations was also statistically different (*p-value* = 0.0207). While, difference in response between changing driving behavior (score 3.63) and impacts of penalty and reward systems (score 3.75) is not statistically significant (*p-value* = 0.558). From this analysis, it can be inferred that in-relationship drivers manifested strong motivations to practice eco-driving in penalty or reward contexts (score 3.75) and least enthusiasm in competition with fellow driver contexts (score 3.12) (Table 4). The results of Thai drivers' manifestations according to their marital status are shown in Figure 1.

Apparently, it can be seen from Figure 2 and Table 4 that education has a positive impact on the behavioral response of different driver groups to practice eco-driving behaviors. Overall, inclination of primary and secondary school drivers is less as compared with high school and university level drivers (Figure 2). To be more precise, the motivation response of high school drivers is most when they are being asked to be in competition with fellow drivers (score 4.39). The university level drivers manifested strong inclination in adopting eco-driving style in penalty or reward context (score 4.27). On the other hand, primary and secondary school drivers showed more interest in changing driving style with eco-driving score of 4.00 and 3.89, respectively. Overall, motivation of all driver groups is less while in competition with other drivers except high school education drivers. The One-factor ANOVA testing results showed that the difference in behavioral response of primary school drivers in mentioned motivation contexts is not statistically different [F(2,63) = 2.8667, *p-value* = 0.0643, F_{crit} = 3.1428]. So further *post-hoc* comparison testing is not conducted. On contrary to that, the intentional behavioral difference of drivers with secondary school education is statistically significant [F (2,114) = 5.5236, *p-value* =
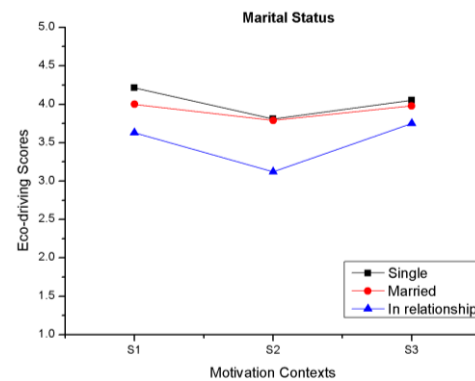

Figure 1. Intentional behavioral response between eco-driving motivations and eco-driving scale with respect to marital status.
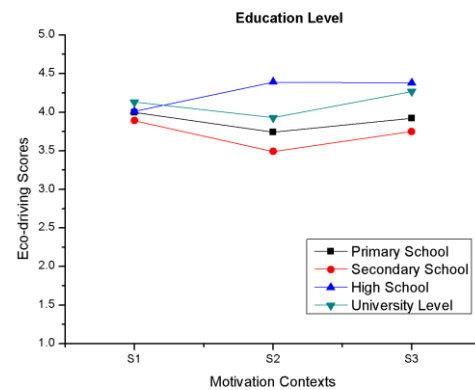

Figure 2. Intentional behavioral response between eco-driving contexts and eco-driving scale with respect to education level.

0.005133, F_{crit} = 3.07585] in given motivation contexts. Further, *post-hoc* comparison testing revealed that behavioral response between changing driving behavior (score 3.89) and competition with fellow driver (score 3.49) contexts is statistically significant (*p-value* = 0.00198). However, the difference in response between changing driving behavior (score 3.89) and penalty or reward systems (score 3.75) (*p-value* = 0.1837) as well as competition with fellow drivers and penalty or reward stems was not statistically significant (*p-value* = 0.0588). The eco-driving motivations of Thai drivers with respect to their education levels are shown in Figure 2.

Apparently, it can be inferred from Figure 3 and Table 4 that different age groups will respond differently in different contexts. For example, overall inclination of senior drivers (more than 50 years old) is more as compared with young (less than 30 years old) and middle-aged drivers (30-50 years old) (Figure 2). However, the One-factor ANOVA testing results showed that the difference in behavioral response of young drivers in mentioned motivation contexts is not statistically different [F (2,24) = 2.8235, *p-value* = 0.0643, F_{crit} = 3.1428]. So further *post-hoc* comparison testing is not conducted. Similarly, the One-factor ANOVA testing results showed that behavioral response of middle-aged drivers in given motivation contexts is not statistically significantly different [F (2,192) = 1.7828, *p-value* = 0.170, F_{crit} = 3.042].
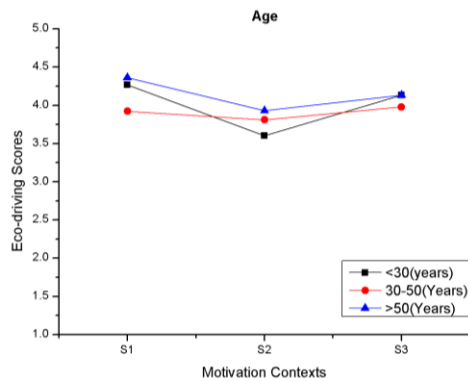
Figure 3. Intentional behavioral response between eco-driving contexts and eco-driving scale with respect to age.
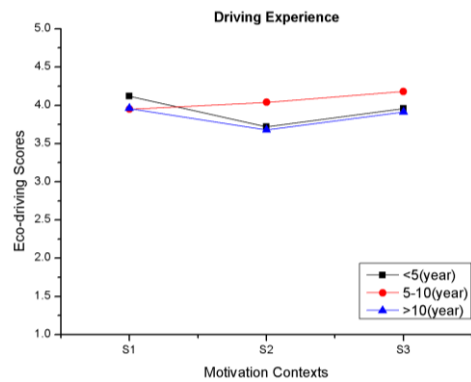

Figure 4. Intentional behavioral response between eco-driving contexts and eco-driving scale with respect to driving experience.

In the same way, the response of senior drivers is not statistically significantly different among given contextual motivations [F (2,24) = 1.1072, *p-value* = 0.3467, F_{crit} = 3.4028].

The eco-driving scores of Thai drivers according to given motivations subject to driving experience variable are shown in Figure 4 and Table 4. While looking at the eco-driving scores one may hypnotize that drivers with 5-10 years of experience manifested strongly in given scenarios. For example, overall inclination of drivers with 5-10 years of experience is more as compared with drivers with less than 5 years and more than 10 years of experience (Figure 4). However, the One-factor ANOVA testing was conducted to investigate if the difference in responses is statistically significantly different or not. The One-factor ANOVA testing results showed that the difference in behavioral response of drivers with less than 5 years of experience in mentioned motivation contexts is not statistically different [F (2,42) = 2.6644, *p-value* = 0.08139, F_{crit} = 3.2199]. So further *post-hoc* comparison testing is not applicable to investigate difference in behavioral response against given motivations in this group of drivers. Similarly, the One-factor ANOVA testing results showed that behavioral response of drivers with 5-10 years of driving experiences in given motivation contexts is not statistically significantly different [F (2,132) = 2.299, *p-value* = 0.104, F_{crit} = 3.064]. In the same way, the response of more experienced drivers (more than 10 years) is not statistically significantly different among given contextual motivations [F (2,78) = 2.6656, *p-value* = 0.07589, F_{crit} = 3.1138]. So, *post-hoc* comparison testing is not required in any group of drivers categorized based on their driving experiences.

4. Discussions and Conclusion

This study explores the role of three types of motivation contexts in adopting eco-driving behaviors: changing driving styles, competition with fellow drivers, and impacts of penalty or reward systems on the behavioral response of Thai drivers. In this study, it is also investigated that the difference in behavioral response of different driver groups based on their demographic features such as marital status, education levels, age, and driving experiences if it is statistically significant or not. This study is unique of its nature as according to the intensive literature review, very

limited studies have been conducted which predict the inclination behavior of heavy-duty vehicle drivers in adopting eco-driving behavior in different contextual scenarios.

The very strong positive correlation of seventy-nine (79%) percent showed that motivation contexts of competition with fellow drivers and penalty or reward have similar kind of acceptance patterns. However, a positive correlation of forty-two (42%) percent between changing driving behavior and competition with fellow driver motivations showed that drivers who are interested in modifying their driving styles are less inclined towards competition with fellow drivers (Table 3).

While observing the inclination behavior of Thai drivers grouped by their demographic features such as marital status, education levels, age, and driving experience, it's been observed that almost all driver groups have statistically similar kind of behavioral response except in-relationship drivers, secondary and high school education drivers. For example, the intentions of becoming eco-driver of in-relationship drivers in changing their driving behavior (score 3.63) and competition with fellow drivers (score 3.12) and penalty and reward systems (score 3.75) is statistically significant with (*p-value* = 0. 0133) and (*p-value* = 0.0208), respectively. So, it can be inferred that the intentional behavior for in-relationship drivers from strong motivations to least motivations is: penalty or reward systems > changing driving behavior > competition with fellow colleague drivers (Table 4).

The impact of education is also very important on eco-driving motivations. Apparently, drivers with good education (i.e., high school and university level) have manifested strong motivations in each context to practice eco-driving as compared with primary and secondary school education drivers (Figure 2). However, the intentional behavior of drivers with secondary and high school education is only statistically different. For example, the intentions of becoming eco-driver of secondary school drivers in changing their driving behavior (score 3.89) and competition with fellow drivers (score 3.49) are statistically significant (*p-value* = 0. 00198). In the same way, the manifestations of becoming eco-driver for high school drivers in changing their driving behavior (score 4.01) and competition with fellow drivers (score 4.39) are statistically significant (*p-value* = 0. 00295). Similarly, the response of high school drivers in changing

driving behavior (score 4.01) and penalty or reward systems (score 4.38) is statistically significantly different ($p\text{-}value$ = 0.00148). So, it can be inferred that the intentional behavior for high school drivers from strong motivations to least motivations is: competition with fellow drivers > penalty or reward systems > changing driving behavior (Table 4).

In the end, we observe that almost all driver groups showed strong motivations to become eco-driver in changing driving behavior and penalty or reward contexts except drivers with high school education. Overall motivations of drivers to follow eco-driving styles are least when they are asked to be in competition with fellow colleague drivers. Based on these observations and analysis, we can conclude that drivers are more inclined in changing their driving behaviors if they are properly informed and trained about eco-driving guidelines and practices. However, the role of penalty and reward contexts also cannot be nullified as they showed strong motivations in said scenarios, while they are inherently less interested in competition with other fellow drivers in practicing eco-driving.

4.1 Limitations and future work

As the behavioral response is a solely self-reporting scoring system there might the possibilities of biasedness or distortion of data that may affect the reported results because of the social desirability of heavy-duty vehicle drivers.

In future study, authors would explicitly ask drivers about what kind of eco-driving technique they found more useful and useless in more elaborative way. For continuation of this study, a greater number of drivers will be included and the impacts of their mental engagement on practicing eco-driving motivations will be investigated. Also, the impacts of job security, job status, and company favorable policies on eco-driving motivations will be discussed.

Acknowledgements

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