Behavioral Economics and Nudging Safer Road Behavior in Thailand

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(Received: January 3, 2021; Revised: June 18, 2021; Accepted: July 16, 2021)

Abstract

In Thailand, road traffic deaths among motorcyclists are still the major problem, the public motorcycle are the most concerned group in Bangkok because we usually see many evidences where the public motorcycle passengers do not wear a helmet. The purpose of this research is to apply the Nudge from Behavioral Economic Theory to promote the helmet use among the public motorcycle passengers. In our experiment, we applied the principle of Default Option, we asked the rider to give his passenger a helmet as a Default option. Moreover, we also have cohort Nudge experiment applying the idea of Loss Aversion and Peer Effect. This research found that if the motorcycle taxi rider gives helmet as the default option to passengers, 27.8 percent of them received and wore a helmet. In the Cohort Nudge experiment, we found that applying the idea of Peer Effect can effectively.

Keywords: 1) helmet wearing behavior 2) nudge 3) Motorcycle Taxi Passenger

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Introduction

Road accidents are an important problem in Thailand, affecting human life and property. According to a report of The Office of Transport and Traffic Policy and Planning (2018, p. 4) and World Health Organization (2018, p. 5), Thailand ranked the number 1 road traffic death toll in Asia and the number 9 of the world. Besides, Division of Non Communicable Diseases (2019, p. 9) reported that motorcycle was the number one vehicle causing road traffic deaths, classified by types of vehicles, accounting for 66.7% of the whole road traffic accidents (Table No. 1).

Therefore, wearing a safety helmet is a way to prevent damage caused by road traffic accidents to motorcycle drivers and passengers. Thai traffic laws require motorcycle drivers and passengers to wear safety helmets. Wearing safety helmets shall reduce an opportunity in death for drivers and passengers 58% and 43% respectively (Thai Health Promotion Foundation, 2019, p. 3). Though the traffic laws require motorcycle drivers and passengers to wear safety helmets, in practice helmet-wearing rates are low. Thailand Road Safety Observatory and Road Safety Watch (2018, p. 1) reported that during 2011-2018 helmet-wearing rates among motorcycle drivers and passengers in Thailand did not reach 50%, especially the helmet-wearing rate among motorcycle passenger was only 48% only.

Table No. 1 Causes of death due to road accidents classified by types of vehicles during 2011-2016

No.	Types of vehicles	%
1	Motorcycle	66.7
2	Car	18.2
3	Pedestrian	8.7
4	Pick-up truck and van	3.7
5	Bicycle	1.0
6	Heavy-duty truck	0.8
7	Tricycle	0.4
8	Bus	0.4
Total	**100**	**100**

Reference: Division of Non Communicable Diseases (2019, p. 9)

One of situations about not wearing a safety helmet that can be obviously seen at present is a case of motorcycle passengers (motorcycle taxi passengers) who do not wear safety helmets while riding on motorcycles along different routes like streets or narrow lanes including big roads (Thai Health Promotion Foundation, 2018, p. 1).

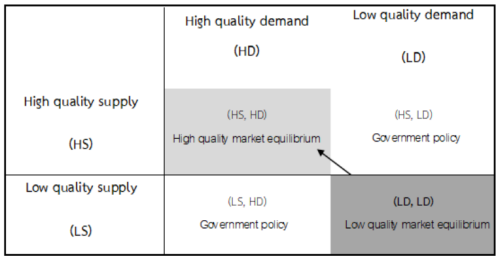
As for the reasons why motorcycle taxi passengers do not wear a safety helmet can be described through an economic view as follow: consideration made to public motorcycle helmet market that comprises safety helmet supply, i.e. motorcycle taxi drivers

(motorcycle taxi stands) who seek and provide (provider) a safety helmet for passengers as a product supplementing passenger transport services while safety helmet demand is motorcycle taxi passengers who have a duty to take a safety helmet to wear while riding on a motorcycle taxi.

Consequences from a less strictly enforced law and a loophole in the law are major factors leading to behavior in not wearing safety helmets among passengers in this market. Consideration made to the supply viewpoint or motorcycle drivers who play a role in providing a safety helmet, it can be found that the reason why drivers do not give importance to or fail to give a safety helmet to passengers is probably caused by 2 types of cost, namely, [1] a cost for being arrested is quite low. Though the law requires motorcycle drivers and passengers to wear helmets, considered to be a cost when being arrested, driving through small streets or narrow lanes are driving through areas where there are no many police officers spend their time on patrol, or even driving on a main road, it is a short-distance travel spending a little time; therefore, an opportunity to be arrested is very small. In this regard, the cost of this part does not occur or is difficult to occur. The other one is [2] nagging cost. This occurs when drivers feel offering a safety helmet to a passenger is not necessary, not important or it is a time-consuming activity. Thus, they do not wish to offer a safety helmet to passengers. In the event that passengers wish (Demand) to wear a safety helmet, they will be able to ask for it by themselves. In this regard, offering a safety helmet, though it is a low cost, is something disturbing their mind for not to do or being lazy to do. This case can be connected to the concept about default option by Samuelson and Zeckhauser (1988, pp. 8-11), one of significant theories of behavioral economics, that identifies that people are more likely to stick with the default choice or the status quo than to make other choices. Under the circumstances, drivers do not offer a safety helmet as the default option to passengers. If passengers would like to wear a safety helmet, they shall ask for it by themselves. It looks like not wearing a safety helmet is a default option while asking for a safety helmet from motorcycle drivers is a secondary option. Consequently, motorcycle taxi passengers are stick with the default option.

With regard to the demand viewpoint towards safety helmets or passengers' viewpoint, passengers who play a role as takers do not feel wearing a safety helmet is necessary, caused by behavioral bias known as present bias. It means the way people put more weight on their present utility than their future utility (Prelec and Loewenstein, 1991, pp. 770-786). It reflects behavior of passengers who choose convenience from not to wear a safety helmet at present more than a negative impact that may arise in the future if an accident occurs. Meanwhile, motorcycle drivers do not offer a safety helmet as the default option; therefore, asking for a safety helmet is an additional cost, though it is a small cost, its effect is huge enough to enable passengers not to ask for a safety helmet.

If the problems earlier mentioned from the demand and supply are connected together, equilibrium of public motorcycle helmet market shall occur at a low point of effectiveness of wearing a safety helmet in the demand and supply at an equilibrium point (LS,LD), namely, both motorcycle drivers and passengers do not wish to wear a safety helmet. The supply or drivers do not offer a safety helmet while the demand or passengers do not take a safety helmet as well. In economics, it is called prisoner's dilemma or a situation in which the occurring equilibrium is worse than it should be (Bad Equilibrium). In this case, it is found that it is a situation that each party refuses a better option, making the public motorcycle helmet market at present becomes a low-quality market as seen in Picture No. 1.



Picture No. 1 Prisoner's dilemma

Reference: Researcher (2021)

Due to the causes mentioned above, this research study was conducted by focusing on the sample comprising public motorcycle passengers. The major objective is to employ behavioral economics, the combination between economics concept and psychology, to understand decision making and behaviors of humans more realistically (Colin and George, 2004, pp. 1-2). Richard Thaler, a behavioral economist who was awarded the 2017 Nobel Prize, proposed the nudge concept or nudge theory to alter people's behaviors in different aspects, such as saving behavior, spending behavior, health behavior, happiness behavior, etc. (Thaler and Benartzi, 2001; Thaler and Sunstein, 2009, p. 1). This research study aimed to apply nudging technique concepts to seek which nudge concept is effective for elevating a low quality public motorcycle helmet market at the equilibrium point of LS,LD to a high quality public helmet market at the equilibrium point of HS,HD for both demand and supply as seen in Picture No. 1. Nudge is a method that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. This research study was conducted in both the market demand and supply. As for the supply, one shot nudge experimental study was conducted by using a default option as a safe option for passengers, motorcycle drivers were required to offer a safety helmet to passengers as the default option to see a tendency that passengers shall take the safety helmet and make decision to wear it throughout the duration of the experiment, about 1 hour. As for the demand, cohort nudge experimental study was conducted by presenting media that stimulate people to alter their helmet wearing behavior, designed from loss aversion

(Kahneman and Tversky, 1974, p. 279) and peer effect (Angrist, 2014, pp. 1-2), among the sample who were public motorcycle passengers for 1 week to see a tendency of changes in helmet wearing behavior after the cohort study.

This research is expected that both experimental studies, the default option and the cohort study, shall investigate helmet wearing behavior among passengers in a broader view and the findings in the study shall be applied to propose a policy-based solution to raise awareness of wearing safety helmets in the case of public motorcycles increasingly including bringing a part of the findings to further develop legal regulations to reduce any loss caused by failing to wear a safety helmet accordingly.

Research Objectives

1. To test a one-shot nudge guideline in the supply of public motorcycle helmet market or motorcycle taxi drivers by asking motorcycle taxi drivers to offer the default option in the form of safety helmet wearing to motorcycle taxi passengers.

2. To test a cohort nudge guideline in the demand of public motorcycle helmet market based on behavioral economics concept using framing effect related to loss aversion and peer effect towards helmet wearing behavior of motorcycle taxi passengers.

Literature Review

Literature review of behavioral economics.

This research aimed to study behavioral economics by nudging the sample to have helmet wearing behavior for their safety. According to the literature review, it was found that there were research studies that used nudging techniques to encourage people to alter their behavior in choosing a good option and there were different points of the study as follow:

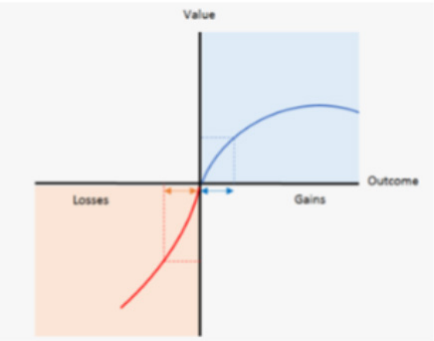
The first point is offering a default option – it described a behavior that people tend to stick with the default option as they believed it is the best one by they would not like to take a risk for changing an option, though they have a chance for changing to other options (Samuelson and Zeckhauser, 1988, pp. 8-11). According to a research study conducted in Europe on default option and intention to organ donation, different questions were raised and it was found that questions designed organ donation was the default option and intention not to donate organs was a secondary option or an opt-out had an influence on an increase in organ donation since the questions encouraged the respondents to become organ donors automatically and people who had no intention to donate their organs were able to change to choose the secondary option (Johnson and Goldstein, 2004, pp. 1713-1716). In Thailand, there was a research study conducted on default option bias in the food consumption of college students in Bangkok and its suburbs. The study was conducted by means of a survey experiment method. The experiment was conducted in a simulated coffee shop where coffee serving sizes were designed from small to big with different prices. The study revealed that recommended menus that were designed

in the form of healthy default option could motivate the college students to consume healthy food increasingly (Chaiwat, et al., 2019, pp. 64-77). There is another research study that designed vegetables and fruits to be a default option and soft drinks were designed to be a secondary option. The findings from the study showed that vegetables and fruits that were offered as the default option could nudge the research participants to have a tendency to choose fruit juice more and more, compared to fizzy drink, with statistical significance (Tangtammaruk, 2017a, pp. 155-158).

Under these circumstances, the default option concept can be connected to safety helmet wearing behavior that if motorcycle taxi drivers or the supply offer a safety helmet to their passengers as the default option, it probably nudges passengers to wear a safety helmet increasingly.

The second point is loss aversion derived from the prospect theory that describes the difference between the feeling of loss and gain. Though the value of loss or gain is equal, the feeling of loss is more intense (Kahneman and Tversky, 1979, p. 279) (Picture No. 2). Consequently, nudging by means of giving loss-related data or negative data shall more easily encourage people to alter their behavior than giving positive data. According to a research study on healthy drink consumption behavior (Tangtammaruk, 2017a, pp. 155-158), it was found that the presentation of loss-related data identifying diseases and images of obese people could encourage the research participants to have a lower tendency to choose soft drink than fruit juice with statistical significance. In addition, there was a research study conducted on opinions towards cigarette signs of non-smoking and smoking students (Tangtammaruk, 2017b, pp. 596-600), which found that horrifying images on cigarette packs could encourage the research participants not to try smoking more than no smoking signs used at present since those horrifying signs could raise awareness of loss aversion from smoking.

Under these circumstances, loss aversion concept can be connected with safety helmet wearing behavior. If passengers lost or gain equally, they feel more sensitive to the feeling of loss than gain. Therefore, nudging passengers to be aware of loss from accidents due to failing to wear a safety helmet would probably encourage passengers to wear a safety helmet increasingly.



Picture No. 2 Prospect theory
Reference: Kahneman and Tversky (1979)

The third point is peer effect. It explains any individual's behavior influenced by the mean score of a group (Angrist, 2014, pp. 1-11), namely, when an individual is influenced by the majority of people who make decision to any direction, the individual's decision making shall have an effect accordingly. According to a research study conducted on the influence of surrounding people by means of public goods game, it was found that people had a tendency to donate more money to public goods if they lived in the society in which surrounding people donate more money to public goods. On the contrary, they would donate less money if their surrounding people donate less, with statistical significance (Weangsamoot, 2014, pp. 73-75). Moreover, there was a research study on electricity consumption behavior among households consuming electricity from Metropolitan Electricity Authority in Bangkok. Research participants were divided into the control group or the study group that was not supplied with any advice and the experimental group that was advised how to save electricity at home and knew the average electricity consumption of every house in the village as comparison data. The findings from the study showed that the households with the advice about methods of saving electricity and knew the average electricity consumption of their neighbors had a decrease in electricity consumption by 6% with statistical significance (Thampanishvong, 2015, pp. 8-21). Behavioral economics was not only applied to the point about public goods and energy saving, according to the literature review, but was also used to study the point about bribery. There was a study conducted on the effect of social norm on university students' bribery behavior influenced by people in society. A situation of doing an examination was simulated and a situation under the influence of surrounding people was inserted. How much of the bribery was measured by the action that an experimenter decided to bribe the examination committee so that the experimenter would achieve the goal sooner. It was found that if people in society lived in a situation in which bribery was considered common, it appeared there would be an increase in university students' bribery, with statistical significance (Siwareepan and Tangtammaruk, 2017, pp. 11-12). If the influence of surrounding people is taken into consideration with safety helmet wearing, individual decision-making to wear a safety helmet shall be perceived by surrounding people. Thus, if the majority of people in society wear safety helmets more and more, other people will wear safety helmets accordingly.

Literature review on safety helmet wearing

The literature review on safety helmet wearing indicated factors associated with safety helmet wearing behavior. According to the literature review, there are 13 factors as follow:

The first factor is gender. There are 7 research studies related to gender but opinions did not come out in the same direction; it is found that men are less likely than women to wear safety helmets, making them have a higher risk of accidents than women with statistical significance (Skalkidou, et al., 2000, pp. 264-267; Li, et al., 2008, pp. 1937-1942;

Chatjina and Ua-Kiti, 2009, p. 9-10; Sreedharan, et al., 2009, pp. 49-54; Papadakaki, et al., 2013, pp. 189-198; Chumpawadee, et al., 2015, pp. 805-821). On the contrary, there are research studies showing that men are more likely to wear safety helmets than women (Hung, et al., 2006, pp. 409-413; Bunprasom and Phetphum, 2016, pp. 803-806).

The second factor is age. There are 3 research studies related to age and opinions came out in the same direction showing that young people are more likely than adults to wear safety helmets (Skalkidou, et al., 2000, pp. 264-267; Hung, et al., 2006, pp. 409-413; Li, et al., 2008, pp. 1937-1942).

The third factor is education level. There are 3 research studies related to education level and opinions came out in the same direction; people with a high level of education are more likely to wear safety helmets than people with a low level of education (Khan, et al, 2008, pp. 384-387; Papadakaki, et al., 2013, pp. 189-198; Thepchali, et al. 2019, pp. 873-880). It can be said that people with a high level of education have knowledge about traffic laws, making them have awareness of wearing safety helmets increasingly.

The fourth factor is marital status. According to a research study on the association between marital status and the use of safety helmet of the research participants in Kerala State, India, it is found that married people are less likely to wear safety helmets than single people (Sreedharan, et al., 2009, pp. 49-54).

The fifth factor is monthly income. According to a research study conducted on safety helmet wearing behavior for preventing accidents among motorcycle drives who are Suan Dusit Rajabhat University students, Thailand, it is found that when people have more monthly income, they have a higher tendency to spend a part of their income buying a safety helmet (Wiriyawat and Sinworn, 2012, pp. 80-83).

The sixth factor is attitude towards traffic laws. According to research studies on such attitude, it is all agreed that if people have negative attitude towards traffic laws, they are more likely to have no awareness of safety helmet wearing compared to people with positive attitude towards traffic laws (Sreedharan, et al., 2009, pp. 49-54; Chumpawadee, et al., 2015, pp. 805-821; Thepchali, et al., 2019, pp. 873-880). Furthermore, there are research studies conducted on attitudes towards self-practice to meet traffic laws. It is found that if people have positive attitudes towards the following of traffic laws, they will have a higher chance to wear safety helmets (Su-nganka, 2016, pp. 52-64).

The seventh factor is the amount of alcohol consumption. There are research studies that agreed in the same direction that people who consume a high amount of alcohol are less likely to wear safety helmets than people who do not drink alcohol (Sreedharan, et al., 2009, pp. 49-54; Papadakaki, et al., 2013, pp. 189-198).

The eighth factor is driving duration. There is a research study finding that people who spend a small amount of time driving are less likely to wear safety helmet than those who spend a large amount of time driving

(Wiriyawat and Sinworn, 2012, pp. 80-83).

The ninth factor is times of the day. According to a research study on behaviors of motorcycle drivers and passengers in Athens, Greece, it is found that people driving motorcycles during night time are less likely to wear safety helmets than people driving motorcycles in other time periods (Skalkidou, et al., 2000, pp. 264-267). However, on the other viewpoint, there is a research study disagreed that people driving motorcycles during morning time are less likely to wear safety helmets than people driving motorcycles in other time periods (Papadakaki, et al., 2013, pp. 189-198).

The tenth factor is traffic density. There is a research study finding that people driving motorcycles in heavy traffic are more likely to wear safety helmets than people who drive in light traffic (Li, et al., 2008, pp. 1937-1942).

The eleventh factor is weather conditions. There is a research study finding that people driving in nice weather conditions are less likely to wear safety helmets than people driving in poor weather conditions (Papadakaki, et al., 2013, pp. 189-198). A research study conducted on the quantity of safety helmet wearing in Kenya found that people driving in low sunlight are more likely to wear safety helmet than people driving in bright sunlight (Bachani, et al., 2016, pp. 23-31).

The twelfth factor is road conditions. According to a research study on factors, obstacles and facilities in the use of safety helmets in Greece among the research participants who are motorcycle drivers, it is found that drivers who drive on poor road conditions are more likely to wear safety helmets than drivers who drive on good road conditions (Papadakaki, et al., 2013, pp. 189-198).

The last factor is associated with a research study on accident experience affecting safety helmet wearing of the research participants who are senior high school students of schools in the south region of Thailand. The study shows that those who had motorcycle accidents are more likely to wear safety helmets than those who have never had a motorcycle accident with statistical significance (Chatjina and Ua-Kiti, 2009, pp. 9-10).

According to the literature review related to safety helmet wearing, it is proved that safety helmet wearing behavior is associated and connected with various variables in different context and situations. In this regard, the researcher brought those reviewed variables to utilize in setting the conceptual framework and determining variables to be analyzed with study results. A hypothesis begins with some factors are probably statistically significant and consistent but some factors may not be consistent since the case study of this research is not conducted on travelling with general motorcycles but motorcycle taxis only.

Literature review on behavioral economics and road safety

According to research studies conducted abroad on behavioral economics and road safety; for example, a research study that brings nudging guidelines like social norm or the influence of people in society to apply for testing seat-belt wearing behavior among adults in Montana State, USA, designed in the form of media for publicizing the information

identifying that most people in society wear seat-belt transmitted through radio and print media. It is found that the perception that the majority of people in society, both drivers and passengers, respond to social norm on road safety results in a higher rate of seat-belt use while travelling significantly (Linkenbach, et al., 2005, p. 1). In addition to the design using media, there is a research study on road safety that designs nudging techniques in the form of warning signs in order to conduct a trial run and assess results before and after warning signs are installed for reducing vehicle speeds on roads according to hypotheses, in Virginia, USA where there are 2 signs, i.e. red flashing LED STOP sign and photosensitive rubber speed humps installed on roads. It is found that both signs designed to have attachment points can help drivers reduce their speed with statistical significance (Arnold, et al., 2007, pp. 1-43). According to the consideration of a study employing behavioral economics to be applied to political policies, especially traffic violation issues, the example of the coastal road in Chicago, USA, full of considerable curves and risks of curve overshooting is presented. A nudging technique is used by painting white color transversely with physical distancing to enable drivers to clearly notice and send a signal to drivers that they are driving at an excessive rate of speed. The study results found that the installation of attachment points by painting white color on roads shall encourage drivers to reduce their speed, helping prevent accidents caused by driving over speed limit. Another nudging technique is the use of 3 dimensional painting on roads in Philadelphia, USA in order to send a signal to driver to be scared of something. Therefore, there is a tendency that drivers adhere to a reduce speed sign on curves and reduce their speed automatically with statistical significance (Triwanchai, 2016, pp. 27-29).

Since previous research studies were conducted on safety helmet wearing in the perspective of social sciences by means of questionnaires, interviews, and observation for data collection, this research study is conducted on safety helmet wearing in the perspective of economics with the application of behavioral economics by adding the experiment using a default option and cohort experiment to reveal various viewpoints in a more well-rounded manner.

Research Methodology

Primary data was employed in this research by collecting data from the two types of experiment, i.e., one-shot nudge with a default option and cohort experiment, as follow:

3.1 Methods to collect data of the one-shot nudge with the default option.

The experiment was conducted by offering the default option to test safety helmet wearing behavior of motorcycle taxi passengers using a nudging technique (Nudge) in the form that motorcycle taxi drivers offer a safety helmet, the default option, to passengers. The control group is the group of motorcycle taxi drivers who have never offered a safety helmet to passengers. The experiment started with designing the experiment context by the researcher. The experiment was

conducted among 4 motorcycle taxi drivers (motorcycle taxi stands) from 4 different areas. The researcher determined each area to have the same characteristics, namely, the experiment sites are motorcycle taxi stands located close to a main road with linking lanes to smaller streets (Soi). Day and time of the experiment is Monday, 7.00-8.00 o'clock, totally 1 hour, which is the period that having a lot of passengers. The method for recording the data is observing motorcycle taxi driver, one at a time, who has never offered a safety helmet to passengers. Then, observing passengers' behaviors in asking for a safety helmet.

As for the experimental group (Treatment group), the experiment is conducted in the following week. The researcher selected the same day, same time, same place and same motorcycle taxi drivers. This round the same motorcycle taxi drivers were asked to offer a safety helmet to passengers and passengers had the right to accept or refuse, in the period of 1 hour similarly to last time as shown in Picture No. 3.

Control group (Default is do not wear a safety helmet)	Treatment group (Default is to wear a safety helmet)
Motorcycle taxi drivers deliver passengers within 1 hour	
Motorcycle taxi drivers do not offer a safety helmet to passengers	Motorcycle taxi drivers offer a safety helmet to passengers
Passengers decide whether or not to ask for a safety helmet from a motorcycle taxi driver	Passengers decide whether or not to wear a safety helmet
The experiment supervisor records the results in percentage	

Picture No. 3 The procedures of the experiment with the default option.

According to the experiment with the default option, real situations were studied for observing and recording the results. It was the study for making a comparison the results between the control group that motorcycle taxi drivers have never offered a safety helmet to one passenger to see a passenger's tendency of asking for a safety helmet (asking or not asking for a safety helmet) and the treatment group that the same motorcycle taxi drivers but have behavior in offering a safety helmet to passengers as the default option to see a changing tendency in decision making to wear a safety helmet (asking or not asking for a safety helmet) of passengers. The experiment is based on the default option concept indicating that if a person offers the first option, a person who is offered the option shall have behavioral bias sticking with the first option for the reason that other options are the loss of the best option that would be incurred, though there is a chance for choosing other options (Samuelson and Zeckhauser, 1988, pp. 8-11).

3.2 Methods for data collection in the cohort experiment study – (1) The second type is an experimental study that requires a follow-up action in order to test safety helmet wearing behavior of motorcycle taxi passengers. The experiment started with selecting university student volunteers who regularly

ride on motorcycle taxis in Bangkok and Samut Prakan to participate in the experiment. The experiment has a test starting from the pre-experimental phase that the experiment participants are required to respond to a questionnaire about safety helmet wearing behavior, which are determined to be the control group. In the experimental phase, the experiment participants are divided into 2 groups in which a nudging technique (Nudge) with media that are differently designed from 2 concepts is used; the first concept is loss aversion by sending media about severe loss caused by motorcycle traffic accidents to the experiment participants every two days for 1 week. The second concept is the influence of surrounding people (Peer Effect) by sending media that identify the mean score of safety helmet wearing of the entire experiment participants every two days for 1 week to encourage those experiment participants to compare their safety helmet wearing behavior to that of surrounding people who participate in the experiment. After 1 week, it is the post-experimental phase that the experiment participants are required to respond to a questionnaire about safety helmet wearing behavior (Table No. 2).

Table No. 2 Procedures of the experiment with a follow-up action (Cohort Nudge)

Pre-experimental phase	**Explain and respond to questions of the experiment participants**	**The experiment participants respond to the questionnaire about safety helmet wearing behavior (Control Group)**
Experimental phase	Assign the experiment participants to see signs (1 group per 1 sign) for 2 times, each time is 2 days away.	
The experiment was divided into:		
	Treatment 1: Loss Aversion	Treatment 2: Peer Effect
	Minor pattern of the experiment is divided into images of loss caused by severe accidents	Media identifying the mean score of safety helmet wearing of the whole experimental group
Post-experimental phase	The experiment participants respond to the questionnaire about safety helmet wearing behavior.	
A period of 1 week.		

3.3 Data analysis for the one-shot nudge experiment

For the analysis of study results based on the experiment according to the objective 1, the researcher used an observation method for behavior in asking for a safety helmet of motorcycle taxi passengers in the 1st round and the acceptance or refusal of wearing safety helmets from motorcycle taxi passengers in the 2nd round. Frequency and percentage were used for data analysis.

3.4 Data analysis for the cohort nudge experiment

For the analysis of study results according to the objective 2, data analysis according to variables used in this research was

conducted. The variables were obtained from data collection through the questionnaire, comprising independent variables selected from significant factors from the literature review, i.e. gender (male, female), age (21-29 years), level of education (a bachelor's degree, higher than a bachelor's degree), marital status (single, married), monthly income (2,000-25,000 baht), the amount of alcohol consumption (never, drinking a small amount of alcohol), accident experience (never, 1-2 times, more than 2 times), attitude towards safety helmet wearing (positive attitude, negative attitude), travelling distance (short distance, long distance), time of the day (morning, afternoon, evening), traffic density (very dense, moderately dense, slightly dense), weather condition (good, poor), road condition (good, poor), and safety helmet wearing media according to nudging guidelines, i.e. negative media or bad effects from failing to wearing safety helmets; for example, images of severe accidents, and media designed based on the mean score of safety helmet wearing by surrounding people. The analysis was conducted using frequency and percentage. As for safety helmet wearing variables, scores are calculated by determining the scoring criteria to measure which behaviors are considered behavior of wearing safety helmet or behavior of not wearing safety helmet to be used as dependent variable. There are 2 procedures of the analysis:

Procedure 1 – frequency in wearing safety helmets per week of passengers is measured in the pre-experimental phase and post-experimental phase. Scores are calculated from levels of frequency in wearing safety helmets by allowing experiment participants to assess behaviors by themselves. Scoring criteria are shown in Table No. 3.

Table No. 3 Scoring criteria in each round of the cohort nudge experiment.

Frequency in wearing safety helmets (Frequency)	Questionnaire about safety helmet wearing behavior in the cohort nudge experiment	
	Pre-experimental phase (score)	Post-experimental phase (score)
Wearing a safety helmet every time	5	5
Wear a safety helmet almost everytime	4	4
Often wear a safety helmet	3	3
Wear a safety helmet sometimes	2	2
Have never worn a safety helmet	1	1

Procedure 2 – Analysis of safety helmet behavior from the pre-experimental phase and post-experimental phase. The sample without safety helmet wearing behavior is determined to be the sample with a low score of safety helmet wearing behavior in the round of post-experimental phase, or have a score of safety helmet wearing lower than the mean score of people in the group (in case behavior is not changed). Dependent variable (Y) is equal to 0. On the contrary, if the sample has a higher score of safety helmet wearing in the post-experimental phase or the score is equal to or greater than the mean score of

the group (in case behavior is changed), the researcher is determined to be the sample with safety helmet wearing behavior. Y is equal to 1. Next, an analysis is conducted in conjunction with independent variables mentioned earlier.

Results

Results based on the objective 1 revealed as follows:

This research study employed the methodology of experimental economics and a questionnaire to study safety helmet wearing behavior among motorcycle taxi passengers for the experiment conducted among motorcycle taxis (motorcycle taxi stands) in 4 areas, 1 person in each area. The same day and a period of 1 hour were selected in order to control various factors. In the control group, a motorcycle taxi driver in each area did not offer a safety helmet to passengers, which is regular behavior, as if not wearing a safety helmet is the default option. In contrast, if passengers would like to wear a safety helmet, they could ask for it from the driver. Throughout the 1-hour experiment, the selected motorcycle taxi drivers from the area 1, 2, 3, and 4 picked up 16, 10, 15, and 18 passengers respectively. According to the study results, if motorcycle taxi drivers from all 4 areas do not offer a safety helmet to passengers at first, the control group decides not to ask for a safety helmet for wearing. On the contrary, in order to control other external factors, the same day, time, place, and motorcycle taxi drivers were selected to conduct an observational study again. This time the same motorcycle taxi driver in each area was asked to change to offer a safety helmet to passengers as the default option, this case was considered as the treatment group. According to the study results, throughout the 1-hour experiment, the experimental group of the area no.1 consisted of 20 passengers. 16 out of 20 passengers only took and held a safety helmet but they did not have safety helmet wearing behavior, accounting for 80%, while another 4 passengers took and wore a safety helmet, accounting for 20%. The experimental group of the area no.2 consisted of 8 passengers. 3 passengers did not take a safety helmet, accounting for 38% while another 5 passengers took and wore a safety helmet, accounting for 62%. The experimental group of the area no.3 consisted of 18 passengers. 2 passengers did not take a safety helmet, accounting for 11% while another 16 passengers took but did not wear a safety helmet, accounting 89%. The experimental group of the area no.4 consisted of 17 passengers. 12 passengers took but did not wear a safety helmet, accounting for 71% while another 5 passengers took and wore a safety helmet, accounting for 29% as shown in Table 4. The experiment results were concluded by seeking the mean score of safety helmet wearing among all passengers using service of motorcycle taxi drivers. It is found that changing the default option to be offering a safety helmet to passengers could help nudge passengers to have an increase in decision behavior to take a safety helmet 60% on average. The proportion of passengers who decided to wear a safety helmet for travel safety was accounted for 27.8% (Table No. 4).

The study results based on the nudging technique using the default option confirm

that changing the default option by encouraging motorcycle taxi drives to offer a safety helmet to passengers shall enable passengers to change their behavior to wear a safety helmet increasingly, without being forced. It means that the mean score of this nudging technique is 27.8%

Table No. 4 Study results of safety helmet wearing behavior of the experimental group based on the default option, classified by motorcycle taxi stand.

Control group (not offering a safety helmet is the default option)		**Treatment group (offering a safety helmet is the default option)**		
Delivering passengers within 1 hour				
Motorcycle taxi drivers do not offer a safety helmet to passengers		Motorcycle taxi drivers offer a safety helmet to passengers		
			Passengers take the safety helmet	
Passengers ask for a safety helmet (person)	Passengers do not ask for a safety helmet (person)	Passengers do not take the safety helmet (person)	Take but do not wear the safety helmet (person)	Take and wear the safety helmet (person)
Motorcycle taxi drivers in Ramkhamhaeng area, Bangkok				
0 (0%)	16 (100%)	0 (0%)	16 (80%)	4 (20%)
Motorcycle taxi drivers in Srinakarin area, Samut Prakan province				
0 (0%)	10 (100%)	3 (38%)	0 (0%)	5 (62%)
Motorcycle taxi drives in Bangpoo Industrial Estate, Samut Prakan province.				
0 (0%)	15 (100%)	2 (11%)	16 (89%)	0 (0%)
Motorcycle taxi drivers in Paknam, Samut Prakan province				
0 (0%)	18 (100%)	0 (0%)	12 (71%)	5 (29%)
Average 0%	**100%**	**12.2%**	**60.0%**	**27.8**

Results based on the objective 2

According to the cohort experiment based on the objective 2, 65 passengers participating in the experiment were divided into 2 groups, i.e. the group consisting of 33 persons nudged by framing to fear of loss (Loss Aversion) and the group consisting of 32 persons nudged by the influence of surrounding people (Peer Effect). Behaviors of frequency in wearing a safety helmet of the participants before and after the nudge were compared to be used as the criteria for classifying the partici-

pants into the group wearing a safety helmet and the group not wearing a safety helmet. The study results of the comparison found that participants in the group nudged by peer effect had an increase in safety helmet wearing behavior from 43.75% to 75%. Experiment participants gave the reason that knowing surrounding people turn to wear a safety helmet increasingly reflects the majority of people give importance to this issue, making them have the same behavior as those people.

While the participants nudged by framing to fear of loss (Loss Aversion), they appeared to have a decrease in wearing a safety helmet, from 57.57% to 42.43%. The experiment participants identified that images of loss or bad effects from accidents are something regularly make known through general media. They saw and received such information already. Therefore, they did not have a huge effect enough to alter their behaviors.

To sum up, the nudging guideline using peer effect shows that communication by giving the big picture of behaviors of the majority of people or pictures showing that most people do the same thing can help adjust present bias, affecting passengers to be lazy or refuse to wear a safety helmet, better than intimidating by bad effects cause by failing to wear a safety helmet.

Table No. 5 Study results of safety helmet wearing behavior of the experimental group in the cohort study

Result comparison	**Number of experiment participants (65 persons)**		**Number of experiment participants (65 persons)**
Before	**Control group 1 (33 persons)**	**Control group 2 (32 persons)**	
Wear a safety helmet	19 (57.57%)	14 (43.75%)	33 (50.8%)
Do not wear a safety helmet	14 (42.43%)	18 (56.25%)	32 (49.2%)
After	**Loss Aversion (33 persons)**	**Peer Effect (32 persons)**	
Wear a safety helmet	14 (42.43%)	24 (75%)	38 (58.5%)
Do not wear a safety helmet	19 (57.57%)	8 (25%)	27 (41.5%)

Remark: wearing a safety helmet refers to passengers who have safety helmet wearing behavior greater than the mean score of safety helmet wearing of the group within 1 week. Not wearing a safety helmet refers to passengers who have safety helmet wearing behavior lower than the mean score of safety helmet wearing of the group within 1 week.

As for the analysis of additional study results using binary choices model to investigate factors affecting safety helmet wearing behavior of the sample, safety helmet wearing behavior is determined to be the dependent variable, 0 is not wearing a safety helmet and 1 is wearing a safety helmet, in the form of probit regression, from Table 6 it is found that factors affecting a change in safety helmet wearing behavior of the sample with statistical signi-

ficance are age, traffic density, road condition, and peer effect. Communication in the form of peer effect gives a chance or probability to enable individuals to change their behavior in wearing a safety helmet increasingly 44.02% with the statistical significance level of 0.05, compared to the use of media showing loss (Loss Aversion) which is something that most people know from public relations. The study results from Table 6 are an additional statistical analysis to test the significance of the studied factors only. However, due to the limitation of the small number of the participants, estimation results are not accurate to some extent. Therefore, they can be used to supplement and support the results from Table No. 5 only.

Table No. 6 Probit regression results

Dependent Variable (n=65)	Coefficient	Marginal Effect (dy/dx)	
Sex	−0.25374	−0.09862	
Age	−0.05217	−0.02011	*
Income	0.02861	0.01103	
Attitude (attitude towards safety helmet wearing)	0.54908	0.21221	
D_time (driving duration)	−0.01787	−0.00689	
T_day (daytime)	0.18287	0.07097	
T_density1 (moderately dense traffic)	−0.93739	−0.35227	*
T_density 2 (very dense traffic)	−1.27154	−0.47133	**
Weather	0.37607	0.14668	
Road (road condition)	0.99761	0.37980	*
Accident1 (accident experience 1-2 times)	−0.14534	−0.05651	
Accident2 (accident experience more than 2 times)	−0.52609	−0.20684	
Sign (peer effect)	1.20975	0.44020	**
Constant	0.24859		

Remark: * is the statistical significance level of 0.1, ** is the statistical significance level of 0.05.

Other Study Results

The researcher asked the experiment participants further about the reasons for deciding to wear a safety helmet by allowing them to give their open-ended opinions. It is found that the reasons they decide to wear a safety helmet are motorcycle taxi drivers have a safety helmet available (29.17%), safety consideration (25.00%), and fear of accidents (20.83%). The main reasons from the experimental group for deciding not to wear a safety helmet are a safety helmet is not clean (36.36%), motorcycle taxi drivers do not offer a safety helmet (27.27%), and traffic laws are not strictly enforced (18.18%) respectively (Table No. 7).

Table No. 7 Reasons for deciding to wear or not to wear a safety helmet.

Wear a safety helmet.	%	Do not wear a safety helmet	%
Motorcycle taxi drivers have a safety helmet available	29.2	A safety helmet is not clean or not hygienic	36.4
Safety consideration	25.0	Motorcycle taxi drivers do not offer a safety helmet	27.3
Fear of road accidents	20.8	Traffic law related to failing to wear a safety helmet is not strictly enforced	18.2
Cleanliness of a safety helmet	12.5	It is not comfortable to wear a safety helmet, a safety helmet is heavy and causes thermal discomfort with heat and humidity	9.1
Law enforcement	8.3	Short distance travel, not riding on main roads	9.1
Very hot weather	4.2	-	
Total	**100**	**Total**	**100**

Conclusion and Discussion

This research study employed observation and a questionnaire for data collection, similar to previous studies, including presentation through different methods by applying behavioral economics and experimental economics, and aimed to change behavior and increase the proportion of safety helmet wearing in case of motorcycle taxi passengers. As for the supply or motorcycle taxi drivers, the study was conducted using the one-shot nudge by offering the default option while the demand was tested using the cohort nudge based on behavioral economics, i.e. loss aversion and peer effect. The findings from the study lead to policy-based suggestion in order to elevate the public motorcycle helmet market from the present equilibrium that is very poor to be the better equilibrium (Picture No. 1). Discussion and policy suggestion can be given in 2 significant points as follow:

1. The supply side or motorcycle taxi drivers – study results from the one-shot nudge by offering the default option to motorcycle taxi passengers, based on observing service providing of motorcycle taxi drivers who did not have behavior in offering a safety helmet to passengers, reveal that none of passengers asked for a safety helmet as a secondary option. In contrast, when the default option was alternated by asking motorcycle taxi drivers to offer a safety helmet to passengers, it could nudge passengers to change their behavior to wear a safety helmet increasingly 27.8%, without being forced. Therefore, one of policy-based suggestions necessary for the supply side is a good social norm should be established by raising a cam-

paign among motorcycle taxi drivers to offer a safety helmet to passengers every time before they leave the service point as if safety helmet wearing is the default option. In addition, policy-based suggestions in this study on raising a campaign, asking for cooperation or a measure encouraging motorcycle taxi drivers (Supply) to offer a safety helmet to passengers are outstanding in behavioral economics, namely, they are guidelines possibly used to alter passengers' behaviors since passengers do not feel they are forced to do (since they can refuse) and a huge budget is not required. The suggestions are consistent with the research study conducted by Johnson and Goldstein (2004, pp. 1713-1716) finding that designing the questions about organ donation as the default option while people can change to a decision not to donate organs made an increase in organ donation. They are also consistent with the research study conducted by Chaiwat, et al., (2019, pp. 64-77) finding that designing the recommended menu as the default menu for being healthy could help the sample have healthy food consumption behavior increasingly. Besides, they are consistent with the research study of Tangtammaruk (2017a, pp. 155-158) that designed fruits as the default option for having good health and it was found that the sample had behavioral change in choosing to consume fruit juice more and more with statistical significance.

2. The demand side or motorcycle taxi passengers – in the cohort nudge experiment to study safety helmet wearing behavior of passengers nudged by different methods, i.e. fear of loss (Loss Aversion) and the influence of surrounding people (Peer Effect), it was found that presenting media according to the influence of surrounding people (Peer Effect) by allowing volunteers who participated in the experiment to perceive behaviors of people in the group, here is perceived average rate of safety helmet wearing of the group, decision making to wear a safety helmet of a person was perceived by everyone in the group, making passengers who are the volunteers have safety helmet wearing behavior increasingly. It shows that when passengers see surrounding people wear a safety helmet, they shall be motivated to wear a safety helmet more and more. It reflects that any person being in the role of passenger shall be aware of the importance of safety helmet wearing for safety. Therefore, the nudging technique using peer effect is workable to encourage passengers to wear a safety helmet increasingly, leading to a policy-based guideline for promoting safety helmet wearing based on a current situation that passengers are unable to decide to wear or not to wear a safety helmet. Emphasis should be placed on making policies in conjunction with changing message to let passengers perceive that the majority of people in society wear a safety helmet to generate safety helmet wearing behavior. It is believed that consequences from offering a safety helmet as the default option and if people in society wear safety helmets more and more, they will help promote a higher number of people wearing safety helmets. Consequently, peer effect shall work effectively, similar to wearing surgical masks at present. This finding is consistent with the research study of Weangsa-

moot (2014, pp. 73-75) showing that if society contribute more to public goods, people shall have behavior in donating money to public goods increasingly. It is also consistent with the research study conducted by Thampanishvong (2015, pp. 8-21) finding that if neighbors save electrical energy, people shall have electrical energy saving behavior increasingly with statistical significance. Moreover, it is consistent with the research study conducted by Siwareepan and Tangtammaruk (2017, pp. 11-12) finding that if people in society see bribery is common, people shall have a tendency to bribe accordingly.

Besides, the use of an additional policy to make safety helmets clean and hygienic, such as availability of safety helmet substitutes to be replaced when the other ones are cleaned or support given from the government sector in providing something, such as caps, head pads or alcohol spray for cleaning, becoming reinforcing factors for passengers to have confidence in wearing safety helmets increasingly.

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