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# An assessment of smoking and non-smoking student preferences for the Thai smoking warning signs

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## Abstract:

The standard no smoking sign or prohibition sign which has a red circle with a red diagonal line through a cigarette picture has been used in schools, universities, as well as public places as a smoking prevention tool in Thailand since 1992. Nevertheless, statistical data indicates that the number of new smokers since 2001 to 2014 has not significantly changed and most of the smokers start this habit between the ages of 15-19 years old. This paper thereby aims to test smoker and non-smoker preference in relation to the standard, current smoking signs as well as other types of signs associated with various behavioral economic principles and psychological ideas. The basic reveal preference approach (RP) and state preference approach (SP) were used in order to test their preference, and the economic binary choices model with the maximum likelihood (ML) estimation was used to measure factors affecting the prevalence of smoking. This paper found that the majority of both smokers and non-smokers preferred Pictorial Health Warning (PHWs) signs which relates to the principle of loss aversion to other types of smoking warning sign. Basically, PHWs is used on the cigarette package which is not often seen by the non-smokers, even the smokers can prevent these PHWs by replacing cigarette packs with cigarette holder cases after buying cigarette packs. However, applying PHWs as a sign posted on school, university, and public places can, to a certain extent, make individuals more concerned about their future losses from smoking. Additionally, this paper found that males, and having friends smoking were two significant factors affecting individual smoking behavior. Finally, we hope that an application of PHWs on the smoking signs grounded on the idea of loss aversion could be further developed as another strategy preventing smoking especially for youths in schools and universities.

**JEL Classifications:** D1, D9, I12

**Keywords:** Smoking prevention, youth smoking, pictorial health warning, loss aversion

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## 1. Introduction

Cigarette smoking is a major cause of Chronic Obstructive Pulmonary Disease (COPD), lung cancer, as well as cardiovascular disease (CVD). According to the non-communicable diseases (NCDs) report from World Health Organization (2010), tobacco will become the leading cause of death in developing countries and its related deaths are estimated to be around 8 million worldwide by 2030 which is 10% of all deaths.

In Thailand, smoking was reported as the second ranked cause of NCDs and sickness risk factors in 2009 (Bundhamcharoen, Aungkulanon, Makka, & Shibuya, 2015), and that 20.7 percent of population age above 15 years old in 2014 are smokers (National Statistical Office, 2014).

Recent research has studied smoking issue in various ways. This paper classifies smoking literatures based on 3 smoking related population groups. Firstly, a pre-smoker group, the pre-smoker is a non-smoker who has the probability to become a smoker. Research focusing on this group aims to find reasons explaining why people smoke as well as

smoking preventions (Jarvis, 2004; McAlister, Krosnick, & Milburn, 1984). Secondly, the smoker group, this group consists of smokers who currently smoke and do not have any intention to quit smoking. Literature on this second group usually looks at smoking behavior and finds ways of motivating people within the group to quit smoking (Evans, Hansen, & Mittelmark, 1977; Klesges, Meyers, Klesges, & LaVasque, 1989; McFall, 1970). Finally, the group of smokers who attempt to quit smoking, research on this group has been done on topics relating to smoking cessation (DiClemente & Prochaska, 1982; Glassman et al., 1990; La Torre & Miccoli, 2013; Whittaker et al., 2009).

Seeking a way of tackling the prevalence of smokers in Thailand, this paper begins its investigation focusing on prevention for the pre-smoker group, especially teenagers and adolescents. Smoking is regarded as an individual choice and socially learned behavior. People usually start smoking in their early teens. (Jarvis, 2004). Similarly, in Thailand, The National Statistical Office (2014) shows that since 2001 to 2014, most smokers start the habit at between the ages of 15-19 years old, followed by the age range 20-24 years old (Table 1).

One of the strategies to tackle smoking in Thailand is to reduce the number of new smokers (Mahidol University, 2016). Hence, schools and universities have been announced as smoke free zones or non-smoking areas according to the Non-smokers' health protection act in 1992 (Smoke Free School, 2014; Thailaws, 1992). Smoking warning signs are another tool used for smoking prevention in this strategic plan. Although, there are many types of images, the most recent one is the standard no smoking sign or prohibition sign which has a red circle with a red diagonal line through a cigarette picture. The objective of this sign is to prohibit smoking in all school/university areas as well as to promote no smoking trends among groups of teenagers and adolescents. This smoking sign has been used in schools, universities and public places since 1992, however, regarding Table 1 the number of new smokers since 2001 to 2014 did not significantly decrease or change. This could be hypothesized that even though the no smoking sign has been used for a decade, it might not work effectively as a prevention tool.

TABLE 1. SMOKING AGE OF INITIATION IN THAILAND SINCE 2001-2014  
(number of new smoker)

Year	Smoking age of initiation (years)							
	Less than 10 years old	10 – 14	15 – 19	20 – 24	25 - 29	30 – 34	35 - 39	More than 40
2001	42111	685758	6136079	2926720	470172	162402	39877	63532
2004	30243	748507	5528177	2564884	455994	195252	42267	62359
2007	3372	637907	5728401	2340594	480900	168185	60267	66685
2011	67349	1086217	5828946	2348548	370653	142721	40850	51785
2014	48091	1242240	6103815	1965761	342234	153338	71718	75327

Source: National Statistical Office (2014).

In addition, some previous literatures interestingly found that teenagers and adolescents have a rebellious attitude towards no smoking signs as well as smoking bans, which means the prohibition sign or policy actually increases the likelihood of youngsters taking up smoking (Buddelmeyer & Wilkins, 2005; Earp, Dill, Harris, Ackerman, & Bargh, 2011; Earp, Dill, Harris, Ackerman, & Bargh, 2013).

Despite the no smoking signs or prohibition signs, there are many other different smoking warnings that could be used as prevention for the pre-smoker group. These images are not used widely as the no smoking sign. As such, this paper aims to test the preference of teen smokers and non-smokers in terms of different smoking signs by collecting the data in Bangkok in 2016 with a random sampling method from 625 participants whose ages ranged between 15 to 25 years old. We hypothesize that although all signs share the same objective of smoking prevention, different designs deliver different messages to the target group which lead them to respond in different ways.

The main objective of this paper is to test the preference of pre-smoker, and smoker regarding smoking signs. The criteria that we use to choose signs is based on the behavioral economic theory. We do this by applying behavioral economic principles that associate to an individual's life-cycle addiction and cigarette consumption. To illustrate, the field of behavioral economics is being developed to study people's choices by combining insights from psychology together with economic theory (Varian & Repcheck, 2010). There are some behavioral economic principles that have been developed so as to make predictions about people's decisions, and also study more about their behaviors such as Loss Aversion (Kahneman & Tversky, 1979), Present bias (Colin & George, 2004; Giné, Karlan, & Zinman, 2010; Prelec & Loewenstein, 1991), Projection bias, (Loewenstein, O'Donoghue, & Rabin, 2003), etc. The smoking signs relating to behavioral economic principles were selected and used in our survey. In addition, Preference Testing Methods (Bliss, Anderson, & Marland, 1943; Earp et al., 2011; Lawless & Heymann, 1999, 2010) are applied to test their smoking sign preference.

This paper offers two main contributions to the literature. Firstly, it provides smoker and non-smoker preferences in relation to smoking signs. The paper shows the rank of preferable signs for smoker and non-smoker groups as well as their opinions in the hope that the most preferable sign could be used as another alternative to prevent smoking and also remind current smokers about quitting the habit. Secondly, since we conducted a random sampling in late-2016, we have been able to generate an empirical analysis using an econometric maximum likelihood estimation (MLE) which indicates characteristics affecting smoking behavior of the young generation aged between 15-25 years old.

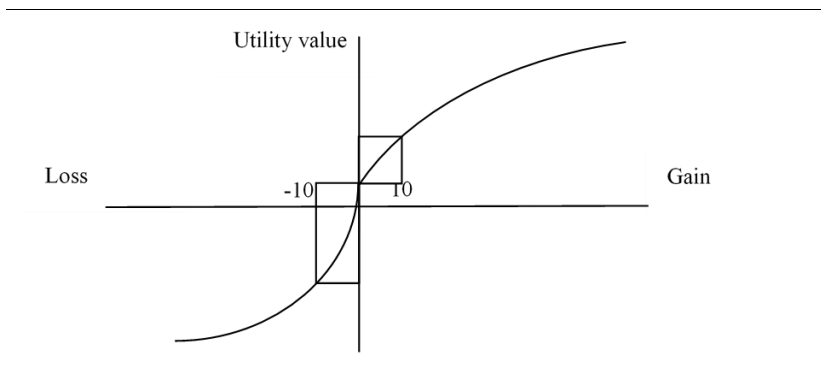
The remainder of the paper is organized as follows. Section 2 reviews the behavioral economic theory and literatures associated with smoking behavior and smoking warning signs. Section 3 outlines research methodology and the empirical model that we use to measure factors effecting smoking behavior. Section 4 describes the data and discusses the main results. Finally, Section 5 is the conclusion.

## 2. Smoking warning signs and behavioural economics

Although there are many types of smoking warning signs, this session focuses on some relating to behavioural economic principles. The first principle analysed in this session is **(1) Loss Aversion** from the Prospect Theory (Figure 1) proposed by Kahneman & Tversky (1979). They proposed that basically people categorize each event as either a gain or a loss. Therefore, there is a utility function over gains and a utility function over loss, as well. According to gains, the utility function displays diminishing marginal utility of consumption or a concave curve. Alternatively, the utility function over losses is somewhat steeper and displays increasing marginal utility of consumption or a convex curve. In other words, people are sensitive to losses when compared to gains of a similar magnitude (Chuah & Devlin, 2011). They have been shown to be loss averse, and

generally dislike losing something roughly twice as much as they like gaining it (Leonard, 2008). Hence, an individual's value function (whether for money, object, or otherwise) is concave for gains but convex for losses (Kahneman & Tversky, 1979).

FIGURE 1. THE PROSPECT THEORY VALUE FUNCTION



Source: Adapt from Just (2013, p.26).

Pictorial Health Warnings (PHWs) on cigarette packs is an obvious case of loss aversion. There are PHWs on cigarette packs worldwide. Basically, smokers receive pleasure, utility, or gain from cigarettes when they smoke without concern about health. PHWs provide images of diseases caused by smoking so as to frighten smokers about the potential damage to their health caused by the habit. Otherwise, PHWs generate a loss frame to smokers in order to warn them to be aware and fearful of tobacco smoke. Azagba & Sharaf (2013) studied the effect of PHWs in Canada and concluded that warning signs and PHWs could statistically reduce smoking rates in Canada. In the case of Thailand, the World Health Organization (2009) reported that more than 60% of smokers were aware of negative effects from smoking when they saw PHWs and for non-smokers, 98.2% stated that they would not try smoking after seeing the PHWs on cigarette packs.

Normally, PHWs is widely used on cigarette packs, but not often used as a sign posted in schools, universities, and public places. This paper therefore hypothesizes that when PHWs is applied as a sign, it could theoretically prevent a non-smoker from smoking and reminds a smoker to consider quit smoking in case that this person has a loss aversion bias.

The second set of principles reviewed in this session is **(2) Altruism**. Regarding standard economic model (SEM), individual is hypothesized to act as a rational person who always optimizes his/her utility. In other words, economic actors choose to maximize their own well-being, utility or profit, while ignoring the well-being of others (Just, 2013). However, real humans are different from an economic human, so as mentioned above in Section 1, in order to make the economic study more realistic, behavioural economics were combined with insights from economic theory. Therefore, the economist adopted idea of altruism as a social preference, or preferences that take into account the well-being or actions of others, and refer to a person who is willing to make others better off as altruistic (Just, 2013). Altruism is used to consider various economic issues as economics of giving (Andreoni, 1990; Kolm, 2006), fairness (Fehr & Schmidt, 2005), welfare

(Lindbeck & Weibull, 1988) and public goods (Andreoni, 1988; Keser & Van Winden, 2000; Warr, 1983).

In the case of smoking, a standard economic model may focus only on utilities that smokers receive from their habit but when altruism is applied, we may reconsider that a person who smokes or will try to do so, may be concerned about others or second hand smoke since the behaviour creates negative externality. There are some smoking signs that display pictures of children, pregnant woman, the elderly, and families. The message delivered from these signs is to remind people that smoking not only effects the health of those who do it, but also those who do not. However, this kind of sign is not often seen in Thailand. Therefore, we aim to test smoker and non-smoker preference on smoking signs showing an effect of this habit on second-hand smokers, and we hypothesize that a person who exhibits social preference may prefer this kind of sign to others.

**(3) Herd Behavior** (Banerjee, 1992) is the third principle reviewed in this session. When people follow what others are doing, or tend to think or behave similarly, we consider this as Herd Behaviour or behavioral traits (Banerjee, 1992; Shiller, 1995). Besides the no smoking sign, the PHWs sign, and the second-hand smoke sign, an image with celebrities persuading others against smoking might possibly be used as a form of prevention as well. Literatures indicate that celebrities can have an influence on people attitudes, actions, decisions, and health-related behaviour (Hoffman et al., 2017; Tanne, 2000; Viale, 2014). Regarding influences to smoke, W. R. Stanton, Currie, Oei, & Silva (1996) found that besides (1) close friend smoke, (2) girlfriend, boyfriend, or spouse smoke, or when (3) the majority of people we meet in daily life were smokers, a celebrity who smokes is another important factor influencing an adolescent's decision to take up the habit. Similarly, Sargent (2006) indicated that smoking in movies has an impact on European adolescents doing it. Additionally, Stanton, Silva, & Oei (1989), Oei & Baldwin (1992), and Yoo (2016), who studied the celebrity effect on adolescent smoking, suggested that a celebrity may be effectively applied as a strategy to encourage prevention as well as change a youngsters health behaviour. Therefore, this paper selected a sign with celebrities promoting no smoking as another considerable smoking prevention tool.

Finally, **(4) Information**, is another crucial factor individuals used to make a decision. We consider a knowledgeable sign that provides information about the negative effects from smoking. When non-smokers read and understand this, the information will be served as a reference point for the time at which they decide whether to try smoking or not. This situation can be related to an Anchoring effect. The anchoring heuristic was first introduced by Tversky & Kahneman (1974) who stated that people's decision-making is often affected by a starting value, message, information, signal, or anchor. The anchor can be seen as a reference point that influences people's decisions (Chuah & Devlin, 2011; Tversky & Kahneman, 1974). Therefore, providing the negative effects from cigarettes on smoking signs could possibly serve as an anchor that prevents non-smokers from trying the habit as well as convince smokers to consider about quitting.

### 3. Methodology

This paper has two main objectives which are (1) to test smoker and non-smoker preference regarding warning signs, and (2) to evaluate characteristics/factors affecting the prevalence of youths smoking. We collected the data from young smokers and non-smokers aged between 10-24 years. In order to measure preferences in the first objective,

a discrete choice experiment was conducted, and basic methods from the Revealed preference approach (RP) and the State preference approach (SP) were applied.

The revealed preference approach is a statistical method of measuring choices made by individuals in a real situation. In our study, we applied the RP and simplified it in order to make the process of our data collection less complicated. A series of smoking warning signs related to our hypothesis and currently used in Thailand were presented and the participants were asked whether they recognized these in their school, university or public places. Then we asked them to choose the sign that they liked the most and asked them to provide the reason. In addition, to test the consistency in participant's choice, we also employed the basic stated preference approach to compare their decisions with the revealed preference approach. The stated preference approach relies on participants making choices over hypothetical scenarios. In our study, participants viewed a series of smoking signs designed based on the principle of Loss Aversion, Altruism, Herd Behavior, and Information, and then they were asked to judge the 'best' sign from the hypothetical scenarios, in which it is assumed that the former no smoking sign (or prohibition sign which has a red circle with a red diagonal line through a cigarette picture.) at his/her school or university will be replaced by this selected sign.

Besides measuring the participant's preference in relation to smoking signs, their socio-economic as well as smoking related factors were collected using the econometric binary-choices model in order to achieve our second objective.

$$\text{SmokingBE} = f(\text{Gender, Age, Family smoking, Friend smoking, Income, Smoking sign}) \quad (1)$$

Equation 1 presents the function that we use to estimate factors affecting smoking behavior. This behavior is a dependent variable which is equal to 1 when the participant is a smoker and equal to 0 when he/she is a non-smoker. While, gender, age, family smoking, friends smoking, income, and types of smoking signs serve as independent variables, age and income are the quantitative variables. Gender is a dummy variable which is equal to 1 when a participant is a male, and 0 when a participant is a female. Family smoking is a dummy variable which is equal 1 if the participant has a family member smoking, and is equal to 0 if not. Friends smoking is identical which is equal to 1 if the participant has a friend (friend in the same group/close friend) smoking, and equal to 0 if not. Finally, 5 types of smoking warning signs which are (1) the standard no smoking sign, signs with the application of (2) Loss Aversion (PHWs signs), (2) Altruism (signs with the picture of second-hand smokers such as pregnant mother, child, elder), (3) Herd Behavior (signs with celebrities promoting no smoking), and (4) Information (signs with an information about the negative effect of smoking) are added in the model with 4 dummy variables given that the original no smoking sign is a base case.

#### 4. Results

This section presents the results from the field survey conducted in late-2016 in the Bangkok central districts area. A total of 860 non-smoker and smoker samples were surveyed. 276 were junior high school students (10-15 years old), another 290 were high

school students (15-18 years old), and the last 294 were university students (18-24 years old).

TABLE 2. SMOKER AND NON-SMOKER GROUPS BY GENDER

	Male			Female			Total
	Smoker	Non-smoker	All	Smoker	Non-smoker	All	
Junior High School Students	42 (26%)	114 (74%)	156	4 (3%)	116 (97%)	120	276
High School Students	62 (41%)	88 (59%)	150	28 (20%)	112 (80%)	140	290
University Students	85 (55%)	69 (45%)	154	60 (42%)	80 (58%)	140	294
Total	189 (41%)	271 (59%)	460	92 (23%)	308 (77%)	400	860

Beginning with brief smoking behavior of the samples surveyed (Table 2), we found that 41% of male students and 23% of female students are smokers. The group of university student had the highest percentage of smokers with the high school students as the second ranked. According to the descriptive statistical analysis, we found that the average age to begin smoking among the smoker group is 17.16 years old, with median, mode, minimum, and maximum equal to 18, 18, 10, and 23, respectively. This data also consists to the report of National Statistical Office (2014) in Table 1. Regarding the group of non-smokers, around 10% of them stated that they had never entertained the idea of smoking, while being fearful of the negative effects, and a dislike of the smell were the top two reasons of the remaining 90%.

TABLE 3. THE COMPARISON BETWEEN REVEALED (RP)  
AND STATE (SP) PREFERENCES APPROACH

	Standard no smoking sign	Smoking warning sign with PHWs (Loss Aversion)	Smoking warning sign with the picture of second hand smoker (Altruism)	Smoking warning sign with the picture of favored celebrity sign (Herd behavior)	Smoking warning sign with the smoking negative effect information (Information)	Total
RP	199 (23.1%)	402 (46.7%)	141 (16.4%)	86 (10%)	32 (3.8%)	860
SP	161 (18.7%)	450 (52.3%)	185 (21.5%)	43 (5%)	21 (2.5%)	860
Percentage change	-19.09%	11.9%	31.2%	-50%	-34.37%	

Note: % by horizontal calculation

In terms of preference of smoking signs, Table 3 presents the comparison of participant's preferences between the basic revealed preference approach (RP) and the basic state preference approach (SP). The data from this table indicates that a series of smoking warning signs which have disturbing pictures of its damaging effects or the PHWs is not



only the most preferable sign (in RP) but also the most effective sign for smoking prevention that participants paid attention to, if used in their school, university, or public place (hypothetical scenario or SP). Table 4 shows the results from the SP approach by types of smoker and gender, and indicates that smoking warning signs designed with the principle of loss aversion is the most preferable sign for all groups.

TABLE 4. THE RESULT FROM THE STATE PREFERENCE (SP) APPROACH  
BY TYPES OF SMOKER AND GENDER

	Standard no smoking sign	Smoking warning sign with PHWs (Loss Aversion)	Smoking warning sign with the picture of second hand smoker (Altruism)	Smoking warning sign with the picture of favored celebrity sign (Herd behavior)	Smoking warning sign with the smoking negative effect information (Information)	Total
Male smoker	37 (19.7%)	76 (40.2%)	62 (32.8%)	3 (1.5%)	11 (5.8%)	189
Female smoker	23 (25%)	40 (43.5%)	23 (25%)	6 (6.5%)	0 (0%)	92
Male non- smoker	48 (17.7%)	143 (52.7%)	70 (25.8%)	7 (2.6%)	3 (1.2%)	271
Female non- smoker	53 (17.2%)	191 (62%)	30 (9.7%)	27 (8.7%)	7 (2.4%)	308
Total	161	450	185	43	21	860
Nonparametric Methods: Goodness of Fit Tests					Chi-Square ( $\chi^2$ )	
H <sub>0</sub> : There is no relationship between smoking signs preference and types of smoker					78.4857***	
H <sub>a</sub> : There is a relationship between smoking signs preference and types of smoker						
Note: % - by horizontal calculation. *, **, *** - mean statistically significant at 90%, 95%, and 99% confident interval, respectively.						

Basically, types of sign that we prefer may or may not be the one which we believe will work effectively as a smoking prevention tool. According to our survey, most of the participants have a consistent preference, while some, especially those who preferred standard no smoking sign, a picture of a celebrity or a sign with a text message about smoking's negative effects, switched their preference to a PHWs sign, or a second hand smoker sign when they were asked about effectiveness. Some who prefer the standard no smoking sign but switched to PHWs indicated in the same way that although they like the standard warning because it is easy to understand and used worldwide, the PHWs will be more effective than the former one because the picture generates a clear loss frame from cigarette smoke and makes people aware and afraid of the damage it can cause.

Basically, PHWs can be seen on the cigarette pack which is not often seen by the non-smokers, while around 69% of the smokers in our sample indicated that they covered the fearful picture on the cigarette pack they bought, or replaced the cigarette package with the new cigarette holder after buying one. Therefore, if the PHWs is used as a sign posted in schools as well as universities, it will often remind both smokers and non-smokers to be aware and fearful about the dangers of smoke.

This is also the same reason for the majority who selected the PHWs sign. While some who switched to the sign with the picture of a second hand smoker (Altruism), provided the reason that this sign might work effectively because the image of pregnant woman, child, or elder stimulates altruism and compassion for the second-hand smokers. In addition, according to a nonparametric goodness of the fit test in the bottom of Table 4, we find that there is a statistical relationship between smoking signs preference and types of smoker.

We now present the results from the econometric binary choices model. Table 5 shows the effect of gender, age, family smoking, friends smoking, income and smoking warning signs on a smoker's behavior.

TABLE 5. CHARACTERISTICS AFFECTING SMOKING PREVALENCE  
(ESTIMATES ARE BASED ON PROBIT ESTIMATION)

Dependent variable: Smoking behavior Smoker (Y=1) and Non-smoker (Y=0)	Model 1	Model 2	Model 3
Independent Variable			
Gender	0.235920***	0.2217053***	-
Age	0.000168	0.0014615	-
Family smoking	0.058659	0.050090	-
Friend smoking	0.398976***	0.3834627***	-
Income	0.150773	0.1439024	-
Smoking warning sign with PHWs (Loss Aversion)	-0.067325*	-	-0.127325***
Smoking warning sign with the picture of second hand smoker (Altruism)	-0.084592	-	-0.0243988
Smoking warning sign with the picture of favored celebrity sign (Herd behavior)	0.138353	-	0.034481
Smoking warning sign with the smoking negative effect information (Information)	-0.0159975	-	-0.0623257
Mean dependent variable	0.3267	0.3267	0.3267
S.D. dependent variable	0.4692	0.4692	0.4692
Pseudo R2	0.200155	0.199743	0.012304
N	860	860	860

Note: \*, \*\*, \*\*\* mean statistically significant at 90%, 95%, and 99% confident interval, respectively.

The probit estimations show that Gender, and Friends smoking are two characteristics relating to youth smoking and this is true even when controlling the effect of signs (Model 1 and Model 2). While, the PHWs sign, which is developed from the behavioral economics' principle of Loss Aversion, is significantly preferred by the non-smokers (Model 1 and Model 3). Beginning with gender, the estimation indicates that if there is a male student the probability that he will smoke is 0.23 (Model 1) and 0.22 (Model 2), respectively. According to gender, this research has different results from the study in Canada by Leatherdale, Manske, & Kroeker (2006). In their study, gender is not a significant characteristic affecting smoking behavior. Comparing this study with our own research Thailand, we can see that in our findings (Table 2) the percentages of male smokers (41%) and female student smokers (23%) are significantly different. In contrast, the study of Leatherdale et al. (2006) in Canada, the smoking rate between the two genders is not very different with 33% for male smokers and 35% for females. We hypothesize that the gender difference in smoking in Western countries might differ from Eastern countries where the number of male smokers is significantly higher than the number of female smokers. Our findings are supported by literature focusing on Asian student smoking prevalence as Naing et al. (2004) who stated that the prevalence of male adolescent smoking in Malaysia was reported as being 30.7%, while the prevalence of female adolescent smoking was around 4.8%. Hasim (2000), who studied smoking habits of students in the case of Saudi Arabia, reported that 20% of respondents were males and only 9% of respondents were females. In Taiwan, Tsai, Tsai, Yang, & Kuo (2008) found that from the sample, 45.7% were male smokers, and 4.8% were females.

Moreover, if an individual has a close friend, a friend in his group, or is close to a senior student who smokes, the probability to smoke is 0.39 (Model 1) and 0.38 (Model 2). This result is consistent with studies in other countries as found by Fisher & Bauman (1988), Øygard, KLEPP, Tell, & Vellar (1995), W. R. Stanton et al. (1996), Bauman, Carver, & Gleiter (2001), Leatherdale, Cameron, Brown, & McDonald (2005), and Leatherdale et al. (2006). Their research indicated in the same way that adolescent smoking is strongly influenced by friends smoking.

## 5. Conclusion

No Smoking warning signs have been used as another prevention tool in every school, and university in Thailand since 1992. However, statistical evidence over the past 20 years shows that in Thailand, most of the smokers start smoking at ages between 15-19 years old. Also, the prevalence of new smokers does not significantly decrease. This paper considers the possibility of replacing the old sign with other types of smoking warning sign, to show how different messages from different signs influences smoker and non-smoker perceptions about smoking negative effect, as well as on individual's risk taking attitude. This paper employs basic ideas from the reveal preference approach (RP) and the state preference approach (SP), while considering the characteristics affecting smoking preferences for groups of school students and university students in Bangkok central districts area using the probit model. The survey conducted for this study revealed that the PHWs sign which presents the picture of illness and negative effects from smoking is the most preferable sign among youth smokers and non-smokers. In addition, 52.3% of participants believed that this PHWs sign will work more effectively as a smoking prevention tool than the former used sign if it is applied to their school or university. Most of the participants who selected the PHWs sign provided the reason that PWHs reminded them about the negative effect from smoking and that it would work more effectively as a sign posted in public places than a picture on cigarette packs because it can often be seen by both smokers and non-smokers. It appears that the prevalence of student smoking is more influential by gender and the smoking behavior of close friends. Regarding the maximum likelihood estimation in the probit model, male students are more likely to smoke, while having close friends smoking significantly increases the likelihood to smoke. One particular suggestion highlighted by this study is that the standard no smoking sign used in Thailand for decades may not work effectively as a smoking prevention tool as people are familiar with it and some previous literatures (Buddelmeyer & Wilkins, 2005; Earp et al., 2011; Earp et al., 2013) indicated that teenagers develop a rebellion effect to the no smoking sign, an reaction typical for this age group when told not to do something. Hence, instead of smoking prohibition, generating loss aversion (Kahneman & Tversky, 1979), or sending fearful messages about smoking's negative effects through Pictorial Health Warning (PHWs), signs may be used as another smoking prevention tool. It is worth carrying out further study in order to explore the effect of PWHs signs on smoking prevalence when replaced or used alongside the standard one.

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