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Elucidating smoking behavior in developed and developing countries

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Trade liberalization and the pervasive advertising of cigarettes have seriously endangered global health. The World Health Organization estimates that smoking causes 4,020,000 deaths annually. Although decreasing in developed countries, tobacco consumption is continually increasing in developing countries. Therefore, this study considers how smoking behavior models of developing and developed countries differ from each other. Concrete strategies are also proposed to control smoking. Ajzen's Theory of Planned Behavior is adopted as the research framework, comprising five dimensions: attitudinal belief, normative belief, control belief, behavior intention and behavior. The research subject includes the standard of living and the advancement of technique to define two groups, that is, developed county (the United States and Japan) and developing county (China and Taiwan). Five hundred questionnaires are distributed and then analyzed using structural equation modeling (SEM), to explore how the variables affect smoking behaviors. Results of this study provide a valuable reference for devising strategies to discourage smoking.

Key words: Smoking behavior, theory of planned behavior, structural equation modeling.

INTRODUCTION

The "Report of the Global Tobacco Epidemic", issued by the World Health Organization in New York in February 2008, indicates that tobacco use is a risk factor for six of the eight leading causes of mortality worldwide. The tobacco epidemic death toll claimed 100 million lives in the 20th century, and currently causes 5.4 million deaths every year. Unless urgent action is taken, more than 8 million people will die from tobacco annually by 2030 and more than 80% of these deaths will be in developing countries. The number of tobacco-related deaths during the 21st century is estimated to be one billion. This phenomenon is attributed to the Transnational Tobacco Companies (TTC), which advocate tariff reduction and market liberalization to allow them to compete with local tobacco companies. These TTCs have exploited the market in developing countries in Asia, Eastern Europe and Latin America, resulting in rapid growth of tobacco consumption.

Therefore, many scholars have begun to propose governmental intervention in tobacco markets. Jha and Chaloupka (2000) recommended that governments

should intervene in the market to curb tobacco consumption for the following reasons: 1) insufficient public knowledge about the public health hazards caused by smoking; 2) insufficient information about smoking leading to addiction and 3) smokers becoming physical and economical burdens on non-smokers.

Many governments have now successfully implemented tobacco control policies, such as imposing retail taxes or tariff to raise the price of tobacco products (Grossman and Chaloupka, 1997; Jha and Chaloupka, 2000), restricting tobacco advertisements and public health warnings on the hazards of smoking (Bettcher et al., 2000). Taiwan has joined the WHO Framework Convention on Tobacco Control (WHO FCTC), and implemented the Tobacco Hazard Control Act in January 2009. The provisions of the Act are warnings on tobacco packs, eradication of misleading words, disclosure of the additive and toxicant composition of tobacco products, a complete prohibition of tobacco advertisements, comprehensive bans on indoor smoking in public places, designated smoking areas in outdoor public places and protection of infants and child-
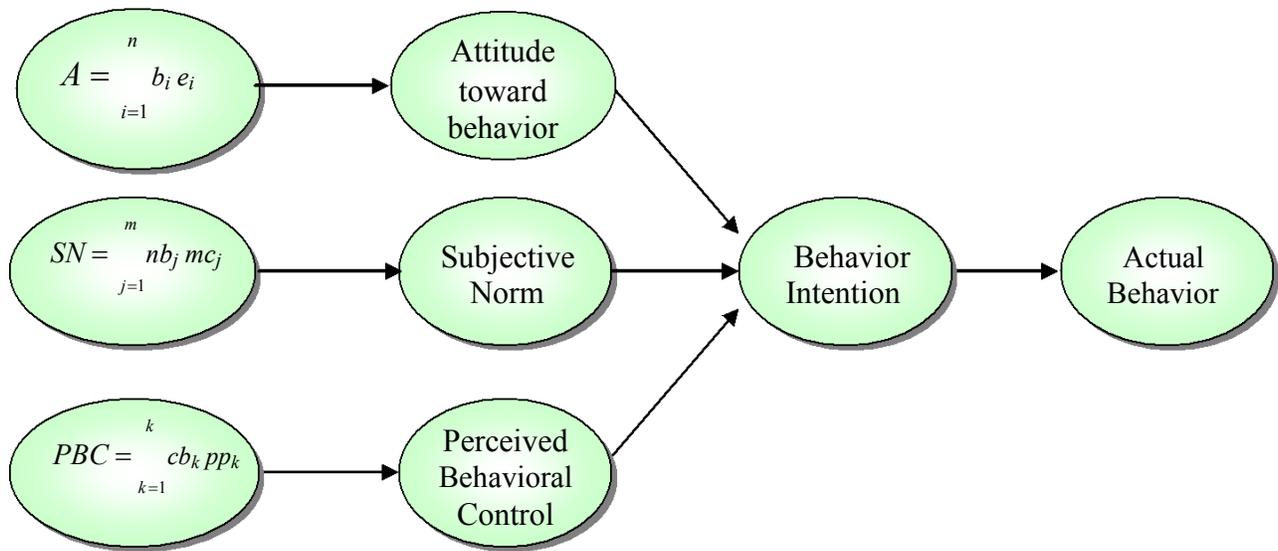
Figure 1. Theory of planned behavior.

ren from smoking. However, creating a smoke-free environment requires government's regulation. Further studies on the factors affecting smoking behavior will help create effective strategies to reduce tobacco hazards and reduce smoking.

This study explores the smoking behavior models of various developing and developed countries by applying the Theory of Planned Behavior. Specifically, this study has the following goals: 1) construct smoking behavior models according to the Theory of Planned Behavior; 2) discover how individuals in developed and developing countries differ in smoking behavior based on the results of testing models, and 3) devise effective strategies to discourage smoking habits and prevent tobacco hazards through the influence levels of research variables.

LITERATURE REVIEWS

From a policy making perspective, this investigation builds different smoking behavior models in different countries based on the development levels. The literature reviews consists of theory of planned behavior, social learning theory, and process of change.

Theory of planned behavior

The Theory of Planned Behavior (TPB) proposed by Ajzen (1991, 2005) was an extension of the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975). TPB is one of the most predictive persuasion theories. It has been applied to studies of the relations among attitude toward behavior, subjective Norm, perceived behavioral control, behavioral intentions and actual behaviors in various fields

such as advertising, public relations, campaigns, healthcare, etc. Theory of Planned Behavior is showed in Figure 1.

Attitude toward behavior (A)

Attitude toward behavior is an individual's positive or negative evaluation of self-performance of the particular behavior. The concept is the degree to which performance of the behavior is positively or negatively valued. It is determined by the total set of accessible behavioral beliefs linking the behavior to various outcomes and other attributes. The interactions can be showed with the Equation 1:

$$A = \sum_{i=1}^{n} b_i\, e_i \quad ....(1)$$

A: Attitude toward the behavior.
b_i: The strength of each belief.
e_i: The evaluation of the outcome or attribute.
n: The number of individual salient beliefs.

Subjective Norm (SN)

Subjective norm is an individual's perception of social normative pressures, or relevant others' beliefs that he or she should or should not perform such behavior. The social normative pressure usually comes from most referents with whom they are motivated to comply, such as parents, spouse, teachers, coworkers, religious groups. In

short, the strength of each normative belief (NB) is multiplied by the person's motivation to comply (mc) with the referent in question, and the subjective norm (SN) is directly proportional to the sum of the resulting products across the m salient referents (See Equation 2). Normative beliefs are individuals' beliefs about the extent to which other people who are important to them think they should or should not perform particular behaviors. Motivation to comply is how much individuals wish to behave consistently with the prescriptions of important others.

$$SN = \sum_{j=1}^{m} nb_j \, mc_j \, \ldots\ldots\ldots\ldots \, (2)$$

SN Subjective norm.
Nbj: The strength of each normative belief.
mcj: The motivation to comply with the referent.
m: Salient referents.

(1) Perceived Behavioral Control (PBC)

Perceived Behavioral Control is an individual's perceived ease or difficulty of performing the particular behavior (Ajzen, 2002). It is assumed that perceived behavioral control is determined by the total set of accessible control beliefs. PBC is assumed to reflect past experience as well as anticipated impediments and obstacles. The more favorable the attitude and subjective norm with respect to intention and the greater the perceived behavioral control, the stronger should be the individuals' intention to perform the behavior under consideration.

A direct path from PBC to behavior is expected to intensify when there is some agreement between perceptions of control or power and the person's actual control over the behavior. The more resources and opportunities indivi-dual's believe they posses and the fewer impediments and obstacles they anticipate, internal or external, the greater should be their perceived control over the behavior. As indicated in Equation 3 below, each control belief (cbk) is multiplied by the perceived power (ppk) of the particular control factor to facilitate or inhibit performance of the behavior and the resulting products are summed across the n salient control beliefs to produce the perception of behavioral control.

$$PBC = \sum_{k=1}^{k} cb_k \, pp_k \, \ldots\ldots\ldots\ldots \, (3)$$

PBC: Perceived behavioral control.
cbk: The strength of each control belief.
ppk: The perceived power of the control factor.
k Number of control factor.

(2) Behavior Intention (BI)

Behavioral Intention refers to a person's intention to perform a given behavior. The strength of an intention is indicated by a person's subjective probability that the person will perform the behavior in question. Intentions are assumed to be the immediate antecedents of actions. The observed relation between intention and behavior depends on two factors: First, the measure of intention has to correspond to the behavioral criterion in action, target, context and time; second, a measure of intention will predict behavior only if the intention does not change before the behavior is observed. Equation 4 shows the components of behavior intention.

$$BI = w_1 A + w_2 SN + w_3 PBC \ldots\ldots\ldots\ldots \quad (4)$$

w1, w2, w3 denote the weight of attitude toward behavior, subjective norm and perceived behavioral control respectively.

Social learning theory

Social learning theory focuses on learning that occurs within a social context, and is extensively adopted in human behavior research. This theory assumes that individuals learn from each another, including such concepts as observational learning, imitation and modeling.

For instance, smoking, drinking and drug abuse are generally regarded as individual behaviors influenced by social environment and learning.

These learning processes always happen in primary groups, including family or friends. Social learning theory emphasizes the importance of observing, imitating and modeling the behaviors, attitudes and emotional reactions of others. Akers et al. (1979) adopted social learning theory as a general explanation of all crime and deviance as an explanation of both corporate crimes against the public and crimes against employers, such as embezzlement.

Akers et al. (1979) presented four distinct concepts or variables as the central features of social learning processes: 1) differential association, 2) definitions, 3) differential reinforcement and 4) imitation.

The process of change

The Trans-theoretical Model of Change (TMC) theory presented five stages of change, namely pre-contemplation, contemplation, preparation, action and maintenance. This theory was developed in 1982 to assess the stages of the smoking habits of cigarette smokers, in order to offer them a suitable smoking cessation intervention. Prochaska and DiClemente (1983) found that these stages occur cyclically or spirally, rather than linearly. Stern et al. (1987) adopted the TMC model to study the behaviors of adolescent cigarette smoking ac-

quisition and proposed four stages of change for adolescent smoking behaviors:

(1) Pre-contemplation: Adolescents who have not begun to think about smoking, or have no desire to start smoking in the future in the future half of a year.
(2) Contemplation: Youngsters who do not smoke, but who are thinking about starting to smoke in the next half year.
(3) Action: Youngsters who have begun to experiment with cigarettes and are deciding whether or not they wish to continue.
(4) Maintenance: Adolescents who are smoking regularly and are committed to smoking now and in the future.

METHODOLOGY

This investigation was performed according to the following survey procedure: establishing the building model, proposing hypotheses, developing the questionnaire, pilot study, reliability, final questionnaire and statistical treatment of data.
  Data were analyzed using the Statistical Package for the SPSS and AMOS.

Model

This study adopted a research model with five dimensions (Figure 2).
  Attitude towards behavior (A): The positive or negative evaluation for the smoking behavior of individuals, divided into three parts: the personal relative benefit (PB) including the self desires to meet, the social relative benefit (SB) including environment maintenance and healthcare tax and the personal relative loss (PL) including self-health and images.

(1) Subjective Norm (SN): Individuals are aware of the important reference groups that define their smoking behavior. The groups are divided into the primary group (PG) and secondary group (SG). The primary group includes family, friends, colleagues, doctors, teachers and elders. The secondary group comprises environmental groups, government health authorities and public interest groups.
(2) Perceived Behavioral Control (PBC) is the subjective assessments of controlling smoking behaviors. It comprises facilitating condition (FC), meaning the acquisition of tobacco and economic conditions and self-efficacy (SE), which means use of tobacco to relieve the negative emotions.
(3) Behavior Intention (BI) refers to the willingness and possibility of performing smoking behavior. It includes the subjective possibility of smoking in the future.
(4) Actual Behavior (AB) adopts the trans-theoretical model of change proposed by Prochaska and DiClemente (1983), and refers to Stern et al. (1987) on the classifications of smoking behavior of adolescents: smoker, sometime smoker, occasional smoker and non-smoker.

Hypotheses

The following eleven hypotheses were tested according to the research model.

H1: Greater perceived personal relative benefit of smoking behavior implies a more positive attitude towards smoking behavior.
H2: Greater perceived social relative benefit of avoiding smoking

behavior implies a more negative attitude towards smoking behavior. H3: Greater perceived personal loss caused by smoking implies a more negative attitude towards smoking behavior.
H4: A larger perceived primary group of smokers implies a more positive subjective norm of smoking behavior.
H5: A larger perceived secondary group of smoking behavior implies a more positive subjective norm about smoking behavior.
H6: Greater perceived facilitating condition of smoking behavior implies more positive perceived behavioral control about smoking.
H7: Greater perceived self-efficacy of smoking behavior implies a more positive perceived behavioral control about smoking.
H8: A more positive attitude towards smokers implies a higher behavioral intention of smoking.
H9: A higher subjective norm toward smoking behavior implies a lower behavioral intention of smoking.
H10: A higher perceived behavioral control about smoking behavior implies a higher behavioral intention of smoking.
H11: A higher behavioral intention of smoking implies greater actual smoking behavior.

Additionally, the external variables of individuals through the various dimensions of belief can indirectly influence behavioral intention. This study explores the impacts of factors belong to the dimensions of smoking behavior model upon the behavioral intention and also discovers the influences of the four external variables, including gender, age, nationality and income.

Questionnaire survey

The questionnaire was developed in three steps, design of question-naire, pretest and translation of questionnaire. These steps are described in detail as follows.

(1) Design of questionnaire: The areas and items covered by the questions were determined by related research on smoking beha-viors to ensure the content validity of this questionnaire. The 7-point Likert scale was adopted to measure each question item. The external variables about personal data were scored on a nominal scale. Structural equation modeling permits both latent and observed variables within the same model. Latent variables are denoted as theoretical constructs, or as factors referring to those phenomena that are supposed to exist but cannot be directly observed. Well-known examples of latent variables are attitudes, subjective norms, perceived behavioral control and behavioral intention. Latent varia-bles can only be observed and measured by observable variables. Conversely, observed variables have direct empirical meanings derived from experience.
(2) Pretest of questionnaire: To determine the effectiveness of this survey questionnaire, it needs to be pretested it before being used. A pretest can help determine the strengths and weaknesses of our survey concerning question format, wording and order. To improve the reliability and validity of the questionnaire, experts from hygiene and health agencies pretested 100 structural questionnaires. The reliability coefficients (Cronbach) should meet the acceptance criteria of 0.70, according to Nunnally (1978) and Churchill (1995).
(3) Translation of questionnaire: The target population covered several developing and industrialized countries. Some foreign language professors were asked to help translate the questionnaire from traditional Chinese characters into English, Japanese and simplified Chinese characters.

The survey sample focused on people aged is at least 18 years old. Owing to the immense survey area, convenience sampling and personal interviews were utilized to overcome the difficulties of large population distribution. Participants from USA, Japan, China and Taiwan were selected to be interviewed during this survey. The total sample size was 500, comprising 125 questionnaires for each
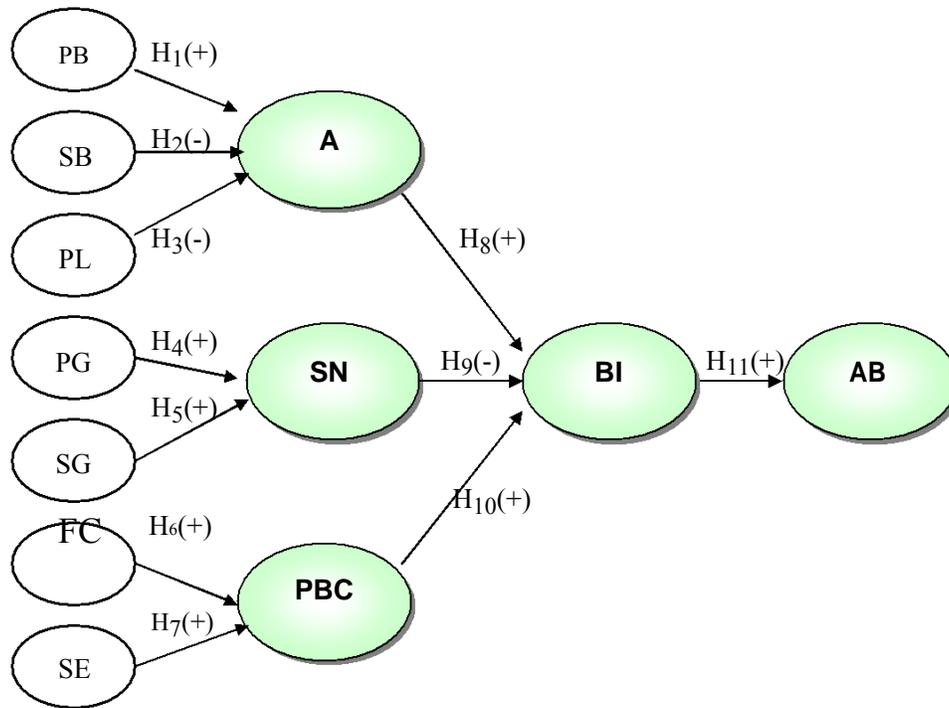
Figure 2. Research model of smoking behavior in Developed and Developing countries.

country.

DATA ANALYSIS AND RESULTS

The Structural Equation Modeling (SEM) statistical techni-que was adopted here to test and estimate causal relationships by a combination of statistical data and qualitative causal assumptions. SEM is a family of statis-tical techniques that incorporates and integrates path and factor analysis (Bagozzi and Yi, 1988), in order to consider the measurement errors and provide fit indicators and mo-dification indicators for model estimation. In addition to distinguishing between indirect and direct relationships between variables, SEM can be used to analyze relation-ships between latent variables without random error and differentiate it from other simpler, relational modeling processes.

Reliability

To ensure that these four different language question-naires were internally consistent, the reliability of this survey was analyzed. Table 1 shows the Cronbach for each country.

Basic data analysis of respondents

Table 2 lists the sample distributions for the developed and developing countries, in order to understand the nationa-

lity distributions in view of gender, age and income. The survey included more smoking males than smoking females in USA (56:44)%, Japan (61:39)% and Taiwan (56:44)%, but not in China (41:59)%. The age of the participants was mainly between 18 and 30 of age for the four countries. Incomes were mainly below $US 150 or above $US1800, except that 30% of respondents from China had incomes in the range of $US 151 – $US 900.

Path analysis for developed and developing countries

The AMOS SEM software was applied with this smoking behavioral model to discover the path coefficients of the United States, Japan, China and Taiwan, and to explore the correlations among each dimension. The adjusted goodness of fit index (AFGI) was adopted to determine whether the tested model should be accepted or rejected. If a model was accepted, then the researcher interpreted its path coefficients. The measure of absolute fit integral, indicating that the path coefficients could be acquire, was set at AGFI > 0.9. The AGFI for the United States, Japan, China and Taiwan were 0.912, 0.901, 0.916 and 0.926 respectively, demonstrating that the models had good overall fit. The analyzed path relation diagrams and path coefficients of the United States, Japan, China and Taiwan are illustrated separately as follows.

USA: According to Figure 3, the attitude over behavior is affected by self personal relative benefit, social relative benefit and personal relative loss, with the path co-efficients

Table 1. Reliability analysis.

Dimension	Sub-dimension	USA		Japan		China		Taiwan	
		Item	Total	Item	Total	Item	Total	Item	Total
A	PB	0.900		0.769		0.792		0.939	
	SB	0.808	0.766	0.740	0.736	0.831	0.810	0.798	0.802
	PL	0.493		0.834		0.893		0.856	
SN	PG	0.943	0.901	0.957	0.855	0.962	0.900	0.987	0.871
	SG	0.707		0.791		0.890		0.855	
PBC	FC	0.807	0.863	0.760	0.610	0.834	0.699	0.944	0.864
	SE	0.959		0.856		0.920		0.979	
BI			0.958		0.852		0.927		0.884
Total Cronbach			0.771		0.763		0.811		0.805

Table 2. Basic data analysis of nationality.

	Item	USA %	Japan %	China %	Taiwan %
Sex	Male	56	61	41	56
	Female	54	39	59	44
	18 - 20	7.3	43.4	29.0	18.9
	21 - 30	51.8	33.3	66.0	26.3
Age	31 - 40	28.2	6.1	4.0	18.9
	41 - 50	10.0	5.1	0.0	25.3
	More than 50	2.7	12.1	1.0	10.5
Income	Less than 150	33.6	37.4	48.0	21.1
	151 - 900	7.3	13.1	30.0	6.3
(US$/paper month)	901 - 1350	15.5	18.2	10.0	10.5
	1351 - 1800	3.6	9.1	5.0	13.7
	More than 1800	40.0	22.2	7.0	48.4

$Cpb = 0.9$, $Csb = -0.562$ and $Cpl = -0.664$ respectively. The path coefficient of personal relative benefit is positive and is the largest among the three factors. Subjective norm is affected by primary group and secondary group with path coefficients $Cpg = 0.382$ and $Csg = 0.369$ respectively (Table 3) . Behavioral intention is positively related to attitude over behavior ($Ca = 0.248$). Hypotheses H1 to H8 and H11 are accepted, but H9 and H10 are rejected.

Japan: Attitude over behavior is positively affected by self personal relative benefit ($Cpb = 0.549$), and negatively affected by personal relative loss ($Cpl = -0.278$), but is insignificant for attitude over behavior. Subjective norm in Japan is only affected by the secondary group ($Csg = 0.208$). Perceived behavioral control is positively influenc-ed only by facilitating condition ($Cfc = 0.238$). Behavioral intention is positively related to attitude over behavior ($Ca= 0.671$), and negatively related to subjective norm

Table 3. Path coefficients of smoking behavior model for USA.

A = 0.9**×PB -0.562**×SB-0.664**×PL
SN = 0.382**×PG+ 0.369**×SG
PBC = 0.34**×FC+0.519**×SE
BI = 0.248**×AT
AB = 0.879*×BI

Note: Two path coefficients of SN and PBC were deleted, as were not significant.

($Csn = -0.420$). Actual behavior is positively affected by behavioral intention with coefficient 0.860. These results confirm H1, H3, H5, H6, H8 H9 and H11, but reject H2, H4, H7 and H10 (Figure 4 and Table 4).

China: Figure 5 shows the path relations of smoking behavior model for China. Attitude over behavior is posi-
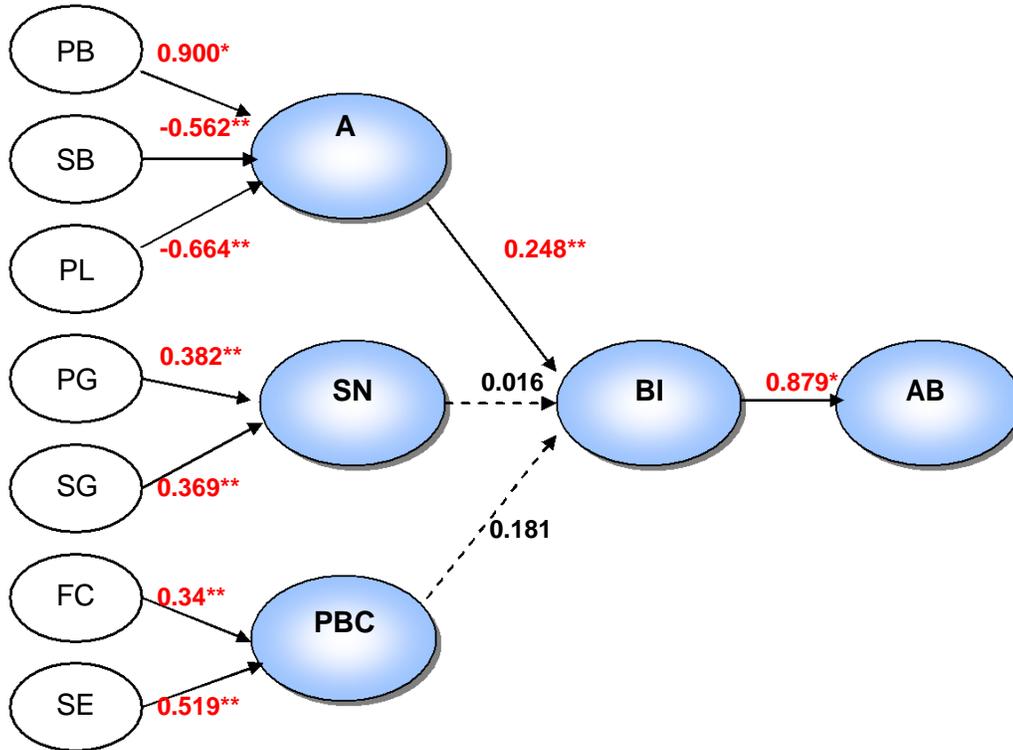
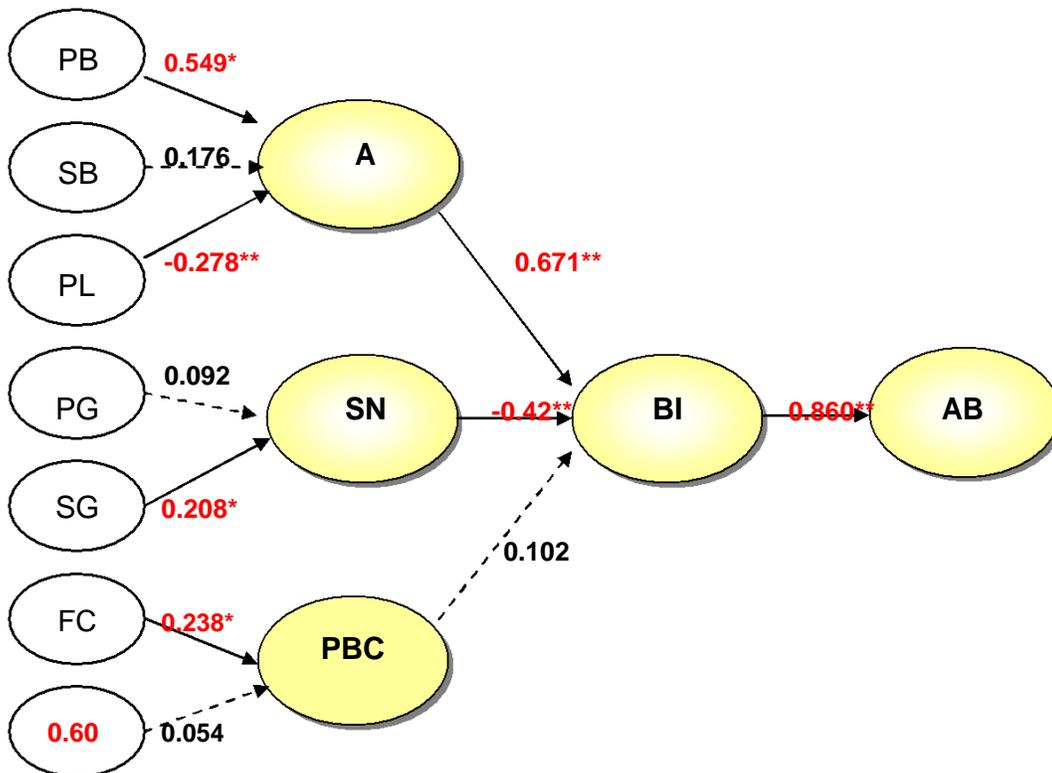**Figure 3.** Path diagram of smoking behavior model for USA.

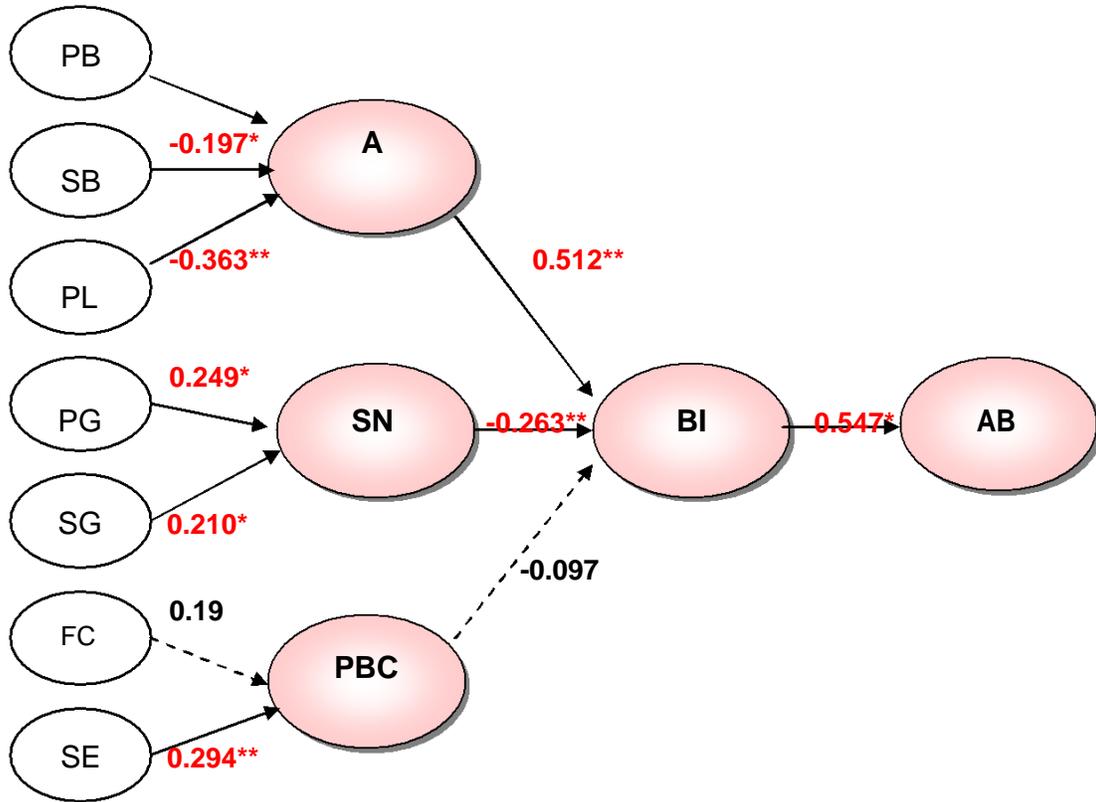**Figure 4**. Path diagram of smoking behavior model for Japan.

Figure 5. Path diagram of smoking behavior model for China.

A = 0.549**×PB -0.278**×PL.
SN = 0.208*×SG.
PBC = 0.238*×FC.
BI = 0.671**×AT–0.42**×SN.
AB = 0.860**×BI.

Note: Path coefficients of SB, PG, SE and PBC were deleted, as were not significant

A = 0.601**×PB -0.197*×SB-0.363**×PL.
SN = 0.249*×PG +0.21*×SG.
PBC = 0.19×FC +0.294**×SE.
BI = 0.512**×AT–0.263**×SN.
AB = 0.547*×BI.

Note: Path coefficient of PBC was deleted, as was not significant.

tively affected by self personal relative benefit (Cpb = 0.601), and negatively affected by social relative benefit (Csb = -0.179) and personal relative loss (Cpl = -0.363). Subjective norm is affected by both primary group (Cpg =0.241) and secondary group (Csb = 0.210). Perceived behavioral control is only by self-efficacy (Cse = 0.294). Behavioral intention is positively affected by attitude over behavior (Ca = 0.512) and negatively related to subjective norm (Csn = -0.263). The relationship between actual behavior and behavioral intention is significant with Cbi = 0.547. These results reject H6 and H10, and accept other hypotheses (Figure 5 and Table 5).

(4) Taiwan: Figure 6 shows the path relations of smoking

behavior model for Taiwan. The relations among attitude over behavior and self personal relative benefit, social relative benefit and personal relative loss are 0.796, −0.568 and −0.583 respectively. Subjective norm is affected by both primary group (Cpg = 0.323) and secondary group (Csg = 0.337). Perceived behavioral control is affected only by self- efficacy (Cse = 0.224). Behavioral intention is positively affected by attitude over behavior (Ca = 0.736) and negatively related to subjective norm (Csn = −0.429) . The relationship between actual behavior and behavioral intention is significant (Cbi = 0.913). These results reject H6 and H10, and accept other hypotheses (Figure 6 and Table 6).
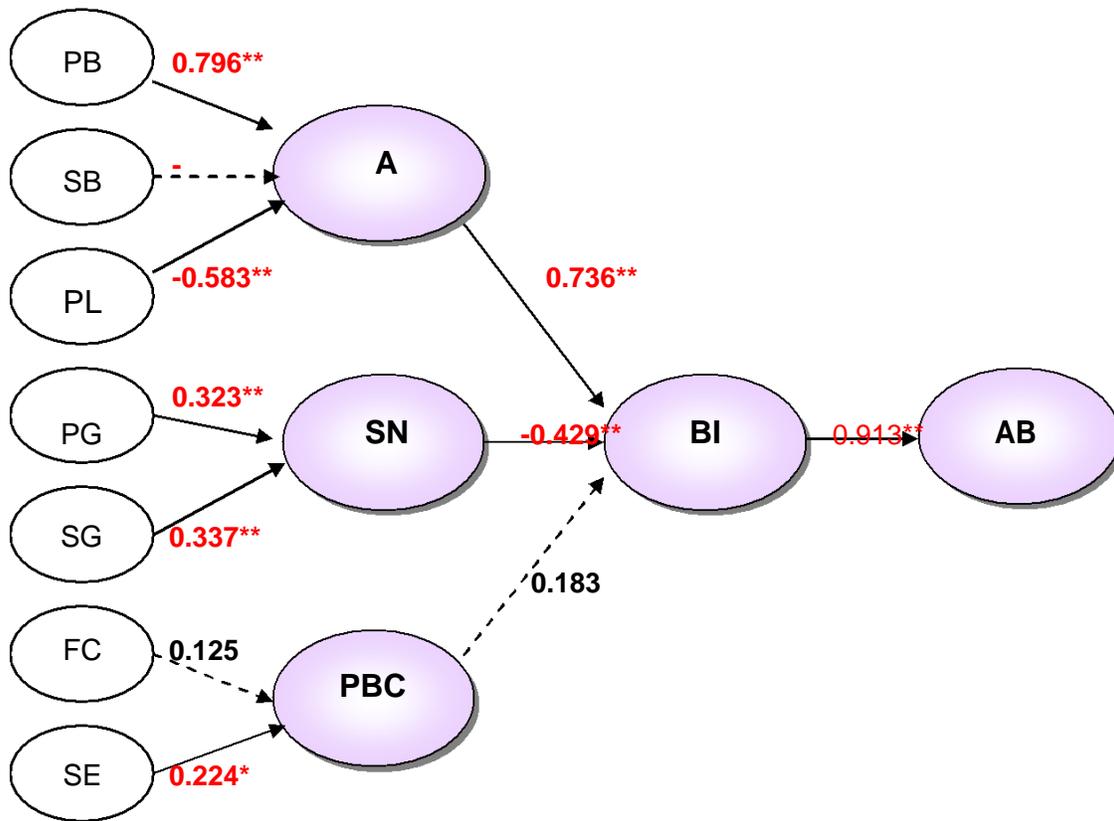
Figure 6. Path diagram of smoking behavior model for Taiwan.

Table 6. Path coefficients of smoking behavior model for Taiwan.

A   = 0.796**×PB -0.568**×SB-0.583**×PL.
S N = 0.323*×PG +0.337**×SG
PBC = 0.224*×SE
BI   = 0.736**×AT–0.429**×SN
AB   = 0.913**×BI

Note: Path coefficient of FC and PBC were deleted, as were not significant.

DISCUSSION AND CONCLUSION

Prevention and control of smoking hazard are of priority concern in the 21st Century. However, the effects of smoking control vary significantly due to differences in na-tional development and innate resources. This empirical study analyzes the smoking behavior models in developed and developing countries to explore the people's smoking behaviors and tests the hypotheses to verify the theo-retical model. The largest difference between developed and developing country is the perceived behavioral control. The facilitating condition related to the acquisition of tobacco and economic conditions significantly influences the perceived behavioral control, but self-efficacy related

to the use of tobacco to relieve the negative emotions does not work in developed countries. Conversely, self-efficacy has more effect on the perceived behavioral control than the facilitating condition in developing coun-tries. Based on these findings, the government can devise strategies to enhance smoking cessation and prevent the smoking hazards. Subjective norms strongly influence the strength of smoking behavior. Families, communities and schools should propagate anti-smoking messages and the ill-effects of smoking. Depending on individual attitudes towards smoking in different countries, governments should reduce the personal relative benefit and enhance the social relative benefit and the personal relative loss to reduce smoking behaviors.

Path analysis results for each country reveal that increasing cigarette taxes would help curb smoking popu-lation and decrease personal desire to purchase tobacco products in the current depressed economy. The current policy in the United States of imposing high tobacco taxes has significantly lowered the smoking population and should be followed by other countries. The following recommendations are proposed for further improving anti-smoking campaigns:

USA: Smoking behaviors are linked to self-related atti-

tudes. The government could reduce smoking through education.

Japan: Japanese smoke behavior is an individual's positive valued self-performance not just for external facilitating conditions. Adding barriers to access to tobacco products would have little impact on anti-smoking campaigns. Tobacco vending machines are found everywhere in Japan. Face recognition system installed in this machine can easily distinguish the buyer's age and avoid the teenagers to get tobaccos. Warning epigrams on tobacco vending machines and tobacco packages may have superior effects. Using popular idol spokesmen in anti-smoking advertising may also curb smoking.

China: Analysis results demonstrate that knowledge of smoking hazards is still weak. This investigation shows that Chinese are typically influenced by external groups and education. Advertisements and idol groups can promulgate anti-smoking information quickly. Education in schools, families and communities can emphasize anti-smoking concepts.

Taiwan: Anti-smoking policies should be implemented practically. Police departments must enforce anti-smoking laws stringently. Public officials must set a good non-smoking example in their own conduct. Government assists public welfare groups to advocate the advantages of not smoking, such as improvement of the environment, better health and protection of the Earth. Reward system for non- smoking should be encouraged to curb the smoking population.

ACKNOWLEDGMENTS

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