"Potential Market Response to Sugar-Sweetened Beverages Taxation in Thailand: Evidences from Real Market Choice Experiments"

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Abstract

Taxation in sugar-sweetened beverages (SSBs) has been proposed in Thailand in April 2016 for health promotion. It suggests imposing excise tax on ready-to-drink (RTD) SSBs at least 20 percent of the retail price and much higher on beverages containing relatively higher sugar level. Theoretically, taxation raises price resulting in consumption reduction. In reality, however, price does not always increase as tax levied. In Thai SSBs market, producers are able to maintain their retail prices using pricing strategies in order to remain competitive with a great number of local beverage vendors whose products are nontaxable. This study examines current consumption behaviors and designs decision-making experiments simulating different circumstances in SSBs market with respect to responses to taxation. The result shows that Thai consumers regularly choose to drink SSBs due to its taste, its refreshingness and easy-to-find characteristics. Discrete choice experiments indicate that there is a possibility of consumption shift from taxed SSBs to untaxed SSBs despite the preference for taxed RTD SSBs. Logistic mixed model reveals that accessibility to SSBs, caloric sugar concentration, and product familiarity are important factors influencing purchasing decision. This also implies that specific tax with rates varied by level of sugar concentration is the most appropriate tax system encouraging producers to reduce the package size and the level of caloric sugar. Still, the government needs to implement non-tax measures to support healthier beverages and restrict high calorie beverages by intervention of distribution channel and availability of product simultaneously. This approach will definitely initiate healthier drinks production as well as encourage consumers to choose healthier beverages over unhealthier ones.

Keywords: Sugar-sweetened beverages taxation; behavioral response; excise taxation; discrete choice model; Thai consumers; untaxed substitutes

JEL Classification: H30, I18, M20, O23

Introduction & Literature Review

An idea of sugar-sweetened beverages' (SSBs) excise taxation has been brought into spotlight over the past few years in Thailand. In April 2016, the National Reform Steering Assembly's (NRSA) approved NRSA's committee on health and environmental reform proposal of levying excise tax on sugar-sweetened beverages (Parliament.go.th, 2016). The proposal suggests a tax structure measured in term of sugar contained in one serving size. In other words, the beverage with higher sugar level is supposed to bear higher tax burden regardless of its price. Then, there were a number of critics and complaints from stakeholders including industry, academics and customers pointing out inefficiency of this excise tax measures and a number of potential negative consequences (Israngkura na Ayudya, 2016; Fredrickson, 2016).

Even though there are many factors contributed to negative health impact, SSBs are proved a major contribution to obesity (Basu et al, 2013) type 2 diabetes (InterAct Consortium, 2013; Odegaard et al, 2008), non-communicable diseases (Odegaard et al, 2011; Mirmiran, 2016; Malik et al, 2010), and dental caries (Armfield et al, 2013; Bernabé et al, 2014;). In Thailand, there exists an association between SSBs consumption and increase in body weight (Lim et al, 2014). In fact, SSBs taxation is not a new idea. It has been used as a source of state revenue and a state's measure for curbing obesity for a long time. These tax-implementing countries include Mexico, France, Hungary, etc. (Chriqui, 2013). The most common tax structure is an ad valorem taxation, which is a tax based on the value of product, and specific tax on package size regardless of amount of sugar. However, the United Kingdom recently proposed specific tax imposed on SSBs whose rate depends on the sugar level (Triggle, 2016).

Ministry of Public Health (MoPH) strongly advocated SSBs taxation in Thailand as they realized that several non-tax measures had failed to encourage people to eat healthier. Therefore, taxation was finally requested to implement with an expectation for increase in price followed by decrease in consumption. Backed by MoPH, Ministry of Finance (MoF) was demanded by private sector to reconsider the proposal claiming a substantial impact to the industry (Prachachat.net, 2016). To compromise the issue, MoF appointed official working group consisting of representatives from both public and private sectors (Thairath.co.th, 2016). While the public sector justified taxation by tax pass-through mechanism, private sector stated another point of view emphasizing how tax would fail to reduce SSBs consumption. A substantial number of untaxed beverages provided by local street vendors could cause consumption shift from taxed products, which are ready-to-drink (RTD) beverages, to untaxed product. Moreover, a beverage producer could adopt alternative strategies to retain affordable price including using low quality ingredients, which are cheaper, and lowering package size. Having different standpoints as well as repeatedly debating without empirical evidences would make it nearly impossible to draw a single conclusion.

In academics, there are a number of recent research papers assessing impact of SSBs taxation on consumption behavior. For example, penny-per-ounce tax on SSBs in United States (Andreyeva, 2011) and in Berkeley (Falbe et al, 2016) would effectively reduce consumption and generate revenue at the same time, a 0.07-euro tax on SSBs in France would decrease consumption of sugar intake for adult and children (Bonnet et al,

2016). However, it is worth noting that neglecting pricing strategies used by manufacturers and retailers could overestimate the effect (Bonnet et al, 2013). Furthermore, it is not reasonable to refer results from research conducted in foreign countries to interpret Thai consumers' responses to SSBs taxation specifically due to differences of market structures, socio-economic factors and behaviors.

To draw a realistic conclusion on potential market response to SSBs taxation in Thailand, policy makers need to examine all factors related to consumers' purchasing decision as well as market structure and producers' pricing strategies. This paper will apply choice experiments to determine how consumers make decision under these circumstances; when producers change their package size corresponding to specific tax imposed, when producers lowering their production costs, when consumers are surrounded by untaxed local producers, and when producers offer low-sugar products with relatively low price. Importantly, it is interesting to explore how public view tax mechanism as a measure to control consumption.

Methods

Survey and Sample

Initial surveys were conducted in January 2017 using both online survey and paper-based survey. The surveys were randomly distributed in Bangkok, Nonthaburi, and Chiang Mai being metropolitan areas where SSBs sale volumes were the highest and customers have access to traditional trades, modern trades, and local vendors. Both surveys were written in Thai language targeting Thai participants. They were collected for one month without response limits.

The surveys include 15 questions, which can be categorized into four parts; i) Respondent's Information, ii) RTD Beverage Drinking Behavior iii) Purchasing Decision in Different Situations, and iv) Perception towards SSBs Tax Policy Effectiveness. Most questions are closed-ended questions asking respondents to rate and to select one or a few choices. There are two open-ended questions related to consumers' age and their willingness to pay more money for their favorite drinks.

In order to simulate random market situation, another online experiment was designed corresponding to results from former surveys considering relevant factors influencing purchasing decision. The experiment was launched publicly for a month in May 2017 set up by Conjoint.ly, which is an easy-to-use online discrete choice experimentation platform that is free of charge for academic research purpose (Kayande and Samoylov, 2017). Any participant who was able to access the internet and comfortable with doing online choice tasks was welcomed to participate in the study.

Perception Measures

This study asks respondents to describe in one word when they first thought of RTD beverages. Word association will be investigated and used as qualitative analysis on customers' perception of a product (Gámbaro, 2012; Hirsh, 2001), in this case, a non-alcoholic beverage (Interlexusa.com, 2012). The survey has listed a number of words related to feeling, taste, health, socialization and product appearance as shown in table 1.

Moreover, participants are free to indicate any words besides given words in the blank space.

Consumption Behavior and Taste Measures

Self-reported SSBs drinking behavior variables include three most favorites types of beverages, weekly consumption frequency, and average price per package of their favorite drinks. Participants also have to determine which beverages could substitute for carbonated soft drinks (CSDs), flavored milk, energy drink, sports drink, juice, RTD tea and RTD coffee. These questions explore consumers' consumption behaviors, substitution behaviors, tastes and chances of shifting from taxed SSBs consumption to untaxed SSBs consumption. To gain more insights, this questionnaire specifically asks major reasons for purchasing RTD SSBs from traditional trades and modern trades and SSBs from local street vendors.

Tax Policy Agreement and Price Resistance Measures

It is useful to explore how the public could perceive or agree with the objective of taxation in curbing consumption as well as how much tax should be levied so that the public would reduce their consumption level. Providing pro-SSB tax message emphasizing that tax could reduce consumption, respondents have to rate how much they agreed on the message. The interpreted result can reflect public support for SSB tax policy (Donaldson, 2014) and may affect purchasing decision. Moreover, the survey asks the additional price that individual is willing to pay for his favorite beverage, assuming the current price is 15 baht.

Behavioral Response to SSBs Taxation Measures

Instead of asking how much consumers will reduce their consumption in response to price increased from tax, it is more realistic to investigate how consumers will behave in the market in which producers can adjust their price and cost freely. Taking producers' pricing strategies and availability of numerous local beverage vendors into consideration, discrete choice experiments are designed to simulate real life decision-making in which consumers have to purchase one product over another at a time (Kjær, 2005). In academic and marketing research, this method is frequently used in assessing attributes of beverages affecting purchasing decision (Oyatoye, 2013; Chan, 2006; Wolf et al, 2011). Yet, this paper suggests policy-makers to reconsider SSBs taxation measures with respect to importance of each attribute.

The study demonstrates choice experiments under different circumstances of producers' strategies in response to tax imposed and accessibility to untaxed SSBs. According to SSBs excise tax scheme proposed by NRSA, it stated that tax should be at least 20 percent on retail price and SSBs with higher sugar contained should bear higher tax burden. First four situations are given in initial surveys based on different assumptions of market responses. The last situation is simulated in an online experiment in which participant will be assigned different choices with different attributes. Participants had to select one product (or none) among available alternatives. Five-choice tasks regarding to market responses are set as follows.

1) In RTD SSBs market where every producer was subjected to excise tax, he/she could shift all tax burden to customer or adjust his/her packaging size as well as ingredient for cost reduction.

Assuming average price and size of RTD SSBs before tax were 15 baht and 330 ml respectively, the alternatives of potential products in the market after tax is demonstrated in figure 1.

2) In SSBs market where RTD beverages and locally produced beverages were substitutes, RTD producer was subjected to excise tax but street vendor was not. Producer could shift partial tax burden to customer while customer had option to buy various alternative beverages from familiar street vendor.

Assuming average price and size of RTD SSBs before tax were 15 baht and 185 ml respectively, the alternatives of potential products in the market after tax is demonstrated in figure 2.

3) In SSBs market where RTD beverages and locally produced beverages were substitutes, RTD producer was subjected to excise tax but street vendor was not. Producer could shift partial tax burden to customer while customer had option to buy various alternative beverages from familiar street vendor and unfamiliar street vendor.

Assuming average price and size of RTD SSBs before tax were 15 baht and 185 ml respectively, the alternatives of potential products in the market after tax is demonstrated in figure 3.

4) In RTD SSBs market where every producer was subjected to excise tax, he/she could shift all tax burden to customer or adjust his/her sugar level for tax burden reduction.

Assuming average price and size of RTD SSBs before tax were 15 baht and 330 ml respectively, the alternatives of potential products in the market after tax is demonstrated in figure 4.

5) Combining 1) 2) 3) and 4) In SSBs market where RTD beverages and locally produced beverages were substitutes, RTD producer was subjected to excise tax but street vendor was not. Producer could adjust their cost freely while customer had option to buy various alternative beverages from both familiar and unfamiliar street vendor.

In this circumstance, discrete choice experiment platform that allows participants to experience random choice set with different attributes was needed. Price, types of beverages, taste, packaging size and level of sugar are the primary variables of interest. Another attribute would be added to tested according to result from the former survey indicating what is the most influential factor when consumer making purchasing decision. In this task, each respondent would have to determine most preferable choice (or none) in 6 choice sets with 4 alternatives per choice set. The choice task conducted in Conjoint.ly is shown in figure 5.

These purchasing decisions over five real-world situations would be analyzed and discussed. Results from surveys including first four choice tasks and result from online discrete choice experiment would be compared and explained for robustness.

Statistical Analysis

This study uses descriptive statistics to examine qualitative data associated with sample characteristics, consumers' perception, and their consumption behavior and taste. For example, what is (are) the major substitute(s) for CSDs and how many respondents will switch to consume untaxed products. Inferential statistics is used to explain how customers make decision under situations of interest.

Mutivariate regression and analysis of variance are conducted to investigate significance of quantitative and qualitative variables to tax policy effectiveness agreement and price resistance. Tax policy effectiveness agreement is measured by the level of agreement, scaled from 1 to 10, to statement indicating that tax policy will be effective in curbing obesity. Price resistance is obtained from question asking respondents to fill in the maximum amount of money they are willing to pay in extra assuming current price of RTD is 15 baht. The multivariate model is

$$Z_{i,i=1,2} = a_0 + \sum_{i=1}^{n} a_i A_i$$

where Z_1 = level of agreement, scaled from 1 to 10

Z_2 = maximum amount of money they are willing to pay in extra and

A_i = Quantitative and qualitative variables of samples

Binary logistic regression is employed to determine how individual makes a decision based on given information or available options, in other word, how customer evaluates each given attribute simultaneously in different scenarios. The underlying assumption is that a consumer will purchase the most preferred product or alternative that yields highest utility compared to other choices (Schroeder, 2010; Maydeu & Bockenholt, 2009). For circumstances set in this study, if available alternatives cannot offset satisfaction gained from initial consumption before tax imposed, a customer will purchase none. The logit model can be defined as

$$\text{Prob}(Y = 1|X_i) = \frac{e^{\beta_i X_i}}{1 + e^{\beta_i X_i}}$$

where Y = 1 is the decision to purchase most preferred SSB product and X_i is a factor affecting purchasing decision including product's attributes assigned in choice experiments, individual characteristics and interactions. During estimating process, the mentioned logit model will be transformed to

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \sum_{i=1}^{n} \beta_i X_i .$$

It is important to note that the obtained parameter estimated by maximum likelihood estimation will reflect how it influences the odd or possibility to buy SSBs for average customer. In other word, whether variables or attributes of interests can statistically change the chance of buying SSBs. The result will be discussed in term of potential policy effectiveness and how the SSBs tax should be designed to promote healthier and generate higher revenue at the same time.

Empirical Results and Discussion

Sample Characteristics

Paper-based survey, online survey and online discrete choice experiment were randomly distributed and conducted for a month each. It is noted that paper-based survey and online survey were the same questionnaire aiming to explore customers' perception and behavior in beverage consumption. Online experiment was solely implemented to measure importance of factors influencing purchasing decision in real market situation. Sample characteristics of initial survey's respondents are shown in table 2 while sample characteristics of online discrete choice experiment are shown in table 3.

Consumer Perception of RTD Beverage

When consumers were asked to define one word when they first thought of RTD beverages. The most selected words are "refreshing" and "cold" (Table 4). Half of survey respondents thought about "refreshing" which is related to feeling term and 23 percent of total respondents selected "cold" which is related to product appearance term. Both words have positive meaning. Unfortunately, only 1 percent chose health-related term while 81 percent of total survey-takers indicated that they acknowledged overconsumption of caloric sugar are academically proved a major contribution to Non-Communicable Diseases (NCDs) such as obesity type 2, cardiovascular disease and diabetes. Moreover, "Refreshing" and "Cold" are related to each other. The result reflects that people need RTD beverage for their refreshing purposes while cold beverages definitely help people feel refreshed during hot weather, which was experienced throughout the year in Thailand.

Consumption Behavior

The result shows that carbonated soft drinks (CSDs) is the most popular type of beverage followed by milk and juice respectively (table 5). More than half of consumers have beverages from 2-4 times a week (table 6). Surprisingly, 22 percent of respondents consume sugar-sweetened beverages at least once a day. However, it is not valid to draw a conclusion that 22 percent of people who drink SSBs at least once a day experiencing high risk of NCDs as it depends on type of beverages actually consumed. Using prior data, it is important to note that drinking CSDs, fruit juice, tea and coffee every day may cause excess calories intake because average amount of sugar contained in those beverages in Thai market is approximately 9 – 14 teaspoons per serving (Thaihealth.com, 2012) being higher than daily amount of sugar limit recommended by American Heart Association (2017). For the average price of beverages, 67 percent of samples indicate that they usually buy their favorite drinks in the range of 15-25 baht (table 7).

Substitution Behavior

The survey asked which kind of substitutes respondents will buy instead when the price of specific drink is increased so high that he/she would stop buying. Lists of major substitutes of CSD, flavored milk, energy drink, sport drink, fruit juice, RTD tea and RTD coffee are shown from table 8 to table 14 respectively. Drinking water is the most selected substitute while locally produced untaxed beverages are only main substitutes of RTD tea

and RTD coffee. This result corresponds with finding in Hungary (Martos, 2016) stating that most people are likely to substitute mineral water and tap water for SSBs with. Fortunately, this is favorable for policy makers who want to see SSBs consumers either stop purchasing SSBs or switch to consume healthier beverages. Moreover, there exists substitution pattern that 39 percent of samples substitute their favorite drinks to all kinds of beverages even though they have different characteristics.

Tax Policy Effectiveness Agreement and Price Resistance

Every sample had to read statement of SSBs taxation in Hungary as the effective policy to encourage consumers to drink less SSBs and the industry to produce less-sugar-sweetened beverages. He/she had to rate the level of agreement from 1 to 10 according to the given message. From 482 observations, the mean level of agreement is 8 with standard deviation equal to 2 while the mode is 10 and the data distribution is skewed left (table 15). It could be reflected that most consumers quite agree that tax could be used as a measure to reduce SSBs consumption.

Assuming favorite kind of beverages' current price is 15 baht, each individual was asked the maximum amount of money he/she would be willing to pay in extra so that he/she would still buy the same product. From 475 observations, the average amount of incremental price is 8.62 with standard deviation equal to 8 while the mode and median are 5 (Table 16). It is worth noting that the log of incremental price is normally distributed. Individual characteristic and consumption behavior attributes are taken into consideration whether they are influential to price resistance. Individual characteristic variables include gender, age and income level while consumption behavior variables include weekly consumption frequency and average price of favorite drink. Multivariate regression and analysis of variance are employed to investigate relationship and significance of each variable. Results from analysis of variance (ANOVA Type II) testing importance of each variable regardless of order implies that only age and average price of beverages consumed are influential to price resistance (Table 17).

Multivariate Regression analysis (table 18) shows that age and average price of favorite beverages are statistically significant. It suggests that the older the consumers, the higher the amount of money they would be willing to pay more for their favorite beverages consumption. Even though assuming the current price of favorite beverage is 15 baht, consumers who normally bought relatively expensive beverages seem to be pay more amount of additional money. This might reflect samples' negligence of given information and their anchoring biasedness to their regular price of favorite beverages. Moreover, it could be inferred that willingness to pay of consumers in beverage industry tends to be determined by beverages' initial prices rather than buyers' income levels.

Potential Responses to SSBs Taxation

SSBs taxation is introduced in order to curb consumption behavior. Decreasing level of consumption is the major objective for policy maker. First of all, this study needs to investigate the reasons people purchase beverages, both ready to drink beverages and locally produced beverages. The initial surveys reveal that first five most selected reasons consumers purchase RTD beverage and local vendors' beverage are the same including tastiness, convenience, thirst-quenching, refreshing and price (table 19 and table 20).

Therefore, it is reasonable to assume that change in taste and price will be able to change consumption behavior.

Under the 1st scenario in which every producer in RTD SSBs market was subjected to excise tax and he/she could shift all tax burden or adjust his/her packaging size or ingredient for cost reduction, most consumers would buy the same product with smaller packaging size (table 21). Unfortunately, only 2 percent would stop purchasing. In this case, people would shift to consume smaller serving size and remain their cost of beverages. This circumstance is acceptable for health aspect due to smaller amount of calories intake per consumption time.

Under the 2nd scenario in which taxed RTD beverages and untaxed locally produced beverages were substitutes and producer shifted partial tax burden to customer, approximately 32 percent of total consumers would remain buying the same product with slight increase in price while another 31 percent would shift to consume favorite locally produced beverage (table 22). 8 percent of consumers would decide to stop buying implying that they prefer only RTD beverages at initial prices. This is consistent with first scenario as people tend to buy their favorite RTD beverage with initial price regardless of size. Unfortunately, this circumstance is not acceptable for health aspect because over 50 percent of consumers shift to drink untaxed product offered by street vendors and remain drinking the same product. What's worse, government will lose a substantial amount of excise tax revenue.

Under the 3rd scenario in which taxed RTD beverages and untaxed locally produced beverages were substitutes and a number of street vendors were available, approximately 34 percent of total consumers would remain buying the same product despite substantial increase in price (table 23). Moreover, people still preferred RTD beverages regardless of the price. A smaller portion of consumer would shift to untaxed product compared with the 2nd scenario due to difference in price. Undoubtedly, about 13 percent of consumers, which was relatively high, would stop purchasing. This implies that when all types of beverages are taxed or highly increased in price, a number of consumers will stop buying consequently. Therefore, it is important for government to enhance fairness for taxation in order to reduce consumption of SSBs.

Under the 4th scenario in which every producer in RTD SSBs market was subjected to excise tax and he/she adjusted the sugar level in order to reduce tax burden, most consumers would buy the same product at the same price despite lower amount of sugar (table 24). It could be explained by the lower price or the lower caloric sugar concentration which has become popular recently (Prachachat.net, 2017). Even though 6.90 percent of consumers would stop buying, 60.88 percent would shift to drink beverages with lower sugar contained. This circumstance is acceptable for health aspect due to smaller amount of calories intake per consumption time.

The last scenario is combined first four circumstances in which taxed RTD beverages and untaxed locally produced beverages were substitutes and producers were free to adjust price, sugar, size or taste of the produce. Being one of the most important factors for purchasing decision, convenience factor represented by proximity to the store would be added to this choice experiment. In each task, 4 alternatives with 6 random different attributes are shown (figure 6). These attributes are product type which is either taxed RTD beverages or untaxed street sugary drinks, price, size, level of sugar, taste or

familiarity and proximity. The beverages' attributes and attribute's levels is based on the actual options available in the real market (table 25).

Total 320 responses having 6 choice tasks each are recorded. Mixed effects logistic regression is employed to analyze how each attribute jointly influence samples' decision to purchase leaving individual respondent characteristic a random effect. Moreover, interaction term between type of products and other factors is computed to investigate whether a customer value attributes differently between taxed and untaxed products. Analysis of deviance is firstly implemented suggesting that every variable statistically influential to purchasing decision or probability to buy a beverage (table 26).

Logistic regression result shows that the size of the product and low sugar concentration positively influence purchasing decision while price, distance to store, regular level concentration negatively influence purchasing decision (table 27). These factors are statistical significant. Moreover, it can be inferred that consumers still prefer RTD beverages as being street vendor sugary drinks decrease the odd of purchasing corresponding with implication under the 3rd scenario. Statistical significances of interaction terms between product type and price and between product type and familiarity imply that people are more reluctant to buy beverages from unfamiliar beverages' vendors and more willing to pay more for that type of beverages. In fact, the price of beverages offered by street vendors is relatively high in the market compared with RTD beverages. This also supports the previous finding that willingness to pay of consumers in beverage industry tends to be determined by beverages' initial prices. Surprisingly, proximity or distance to the store is the most important factor affirming qualitative result specifying importance of convenience. Introduction of low sugar or low calorie beverages may increase odd of purchasing as consumers are less willing to buy beverages that is regular sweetened. In term of substitution, taxed beverages and untaxed beverages are evidently not perfect substitutes. The estimated coefficient of price suggests that price be not as influential as accessibility to product and product familiarity. However, the magnitude of size effect is relatively small meaning that the producer can reduce the package size without harming consumers' decision to buy their products.

The statistical inferences from potential market response reveal a number of recommendations and cautions for policy makers. Even though consumer prefer to drink RTD beverages, a substantial increase in price of RTD may cause consumption shift from RTD beverages to beverages offered by street vendors leading to loss in tax revenue eventually. Hence, it will be more effective in term of consumption reduction if and only if the tax is imposed on every kind of SSBs. Tax system should be designed to encourage producers to reduce their package sizes as well as sugar concentration so that producers could maintain their business growth while consumers had healthier products intake. Besides tax measures, government should enhance accessibility to low calorie and low sugar beverages by intervening distribution channel and availability of product such as enforcing convenient stores to put low calories drink at the eye level and making high sugar- concentrated beverage difficult to purchase. These are non- tax measures internationally widely suggested in academics to influence consumption behavior (Hoy, 2014). Implementing both proper tax measures and extensive non- tax measures simultaneously is the only way government could achieve SSBs consumption reduction objective.

Conclusion and Policy Implication

This study conducts an analysis of SSBs consumption behavior and draws policy recommendation from potential market response of SSBs taxation in Thailand using choice experiments. Empirical results obtained from this study provide behavioral insights and indication for SSBs taxation effectiveness. Descriptive statistics shows that Thai consumers frequently drink highly sugar-sweetened beverages due to its taste, its refreshing and easy-to-find characteristics. Consumers believe that taxation might be able to curb consumption behavior and cause them to buy drinking water instead. Discrete choice experiments simulating how they will behave in real market after tax levied predict that there is a possibility of consumption shift from taxed SSBs to untaxed SSBs, even though SSBs are preferable. Accessibility to SSBs, caloric sugar concentration, and product familiarity are important factors influencing purchasing decision.

In fact, excise taxation is a part of government intervention aiming to restrict consumption of specific goods and services as well as generating higher revenue. Therefore, policy makers should examine market responses and consumption behaviors thoroughly so that they could design the most efficient and effective tax structure. Statistical results imply that specific tax with rate varied by level of sugar concentration is the most appropriate tax system, i.e., SSBs with sugar contained from 8 to 12 grams per 100 ml shall be levied at X_1 baht per liter while SSBs with sugar contained above 12 grams per 100 ml shall be levied at X_2 baht per liter and X_2 is higher than X_1. This structure will encourage producers to reduce the package size since it is least influential as well as adjust the level of caloric sugar for lower tax rate imposed. However, government needs to implement non-tax measures in order to support healthier beverages and restrict high calorie beverages at the same time.

The limitations of this study include the samples' characteristics, the variety of attributes and real market simulation. Firstly, samples are in high SSBs consumption areas which are concentrated in metropolitan areas with middle- to- high- income customers leading to relatively less consideration of low-income customers' behaviors and responses. Secondly, the number of attributes and their levels are limited due to experiment methodology and individual cognitive ability to assess every listed factor explicitly. Lastly, the online choice experiment could not simulated the real world situation perfectly as there are countless factor influencing decision such as weather, individual emotion, etc. The further experiment could replicate the real market environment in laboratory by arranging products with different attributes shown in the actual shelf. In this case, the researcher could examine more on both implicit and explicit factors influencing purchasing decision and make realistic conclusion.

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สมาคมอุตฯเครื่องดื่มไทยชี้ รัฐขึ้นภาษีเครื่องดื่มผสมน้ำตาลแก้ปัญหาไม่ตรงจุด-เลือกปฏิบัติ. (2016, February 25). *ประชาชาติธุรกิจออนไลน์*. Retrieved from http://www.prachachat.net/news_detail.php?newsid=1456380061

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Tables and Figures

Table 1: Example of words listed for word association task

Categories	Word listed
Feeling	Refreshing, Enjoyment, Tiresome, Excitement, Creative
Taste	Sweet, Sugar, Delicious, Spicy, Fizziness, Juicy
Health-Related	Stomachache, Obesity, Healthy, Energizing
Socialization	Playing Sports, Friends, Party, Conversation
Product Appearance	Hot, Cold, Bottle, Can, Glass, Black

Figure1: Example of choices in choice experiment in the first condition

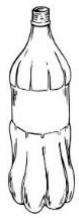
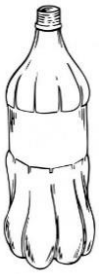
	**Drink**: Favorite **Size**: 330 ml **Price**: 18 Baht		**Drink**: Favorite **Size**: 250 ml **Price**: 15 Baht		**Drink**: Favorite (with Slight Change of taste) **Size**: 330 ml **Price**: 15 Baht

Figure 2: Example of choices in choice experiment in the second condition

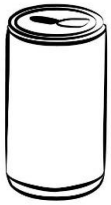
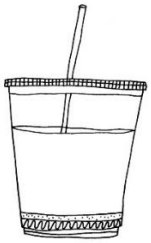
	**Drink**: Favorite RTD **Size**: 185 ml **Price**: 16 Baht		**Drink**: Favorite Locally Produced Beverage **Size**: 185 ml **Price**: 15 Baht		**Drink**: Favorite Locally Produced Beverage **Size**: 350 ml **Price**: 20 Baht

Figure 3: Example of choices in choice experiment in the third condition

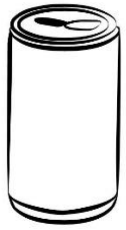
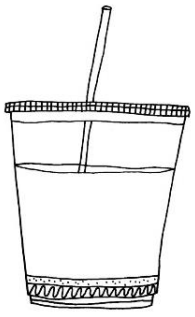
	**Drink**: Favorite RTD **Size**: 185 ml **Price**: 20 Baht		**Drink**: Familiar Locally Produced Beverage **Size**: 185 ml **Price**: 30 Baht		**Drink**: Unfamiliar Locally Produced Beverage **Size**: 350 ml **Price**: 20 Baht

Figure 4: Example of choices in choice experiment in the fourth condition

	**Drink**: Favorite **Sugar**: 12% **Price**: 18 Baht		**Drink**: Favorite **Sugar**: 11% **Price**: 17 Baht		**Drink**: Favorite **Sugar**: 10% **Price**: 16 Baht		**Drink**: Favorite **Sugar**: 8% **Price**: 15 Baht

Figure 5: Example of choice task in the fifth condition

Table 2: Sample characteristics of initial survey's respondents

	Total	N=507	100%
Survey Design	online	287	56.61%
	paper	220	43.39%
Age	15-20	75	14.79%
	21-25	293	57.79%
	26-30	65	12.82%
	Above 30	74	14.60%
Gender	Male	209	41.22%
	Female	298	58.78%
Income	below 10,000 baht	198	39.05%
	10,001-30,000	214	42.21%
	above 30,001	95	18.74%

Table3: Sample characteristics of online choice experiment's respondents

	Total	N=320	100%
Age	15-20	14	4.38%
	21-25	144	45.00%
	26-30	106	33.13%
	Above 30	56	17.50%
Gender	Male	125	39.06%
	Female	195	60.94%
Income	below 10,000 baht	39	12.19%
	10,001-30,000	143	44.69%
	above 30,001	138	43.13%

Table 4: Most selected words when customers were asked to define one word they first thought of RTD beverages

Words	Number of Respondents (N= 507)	% of Total Respondents
1. Refreshing	239	47
2. Cold	116	23
3. Party	18	4
4. Sweet	16	3
5. Juicy	14	3
6. Fizziness	13	3
7. Sweet	13	3

Table 5: Respondents' Types of most favorite drinks

Type of Beverages	Number of Respondents	% of Total Respondents
1. Carbonated Soft Drinks	211	42
2. Fresh Milk and Flavored Milk	197	39
3. Fruit Juice and Veggie	192	38
4. Drinking yogurt	164	32
5. Tea and coffee offered by Street Vendors	106	21
6. RTD tea and coffee	99	20

Table 6: Respondents' Consumption Frequency

Consumption Frequency	Number of Respondents	% of Total Respondents
None	2	0%
1 time a week	31	6%
2 times a week	86	17%
3 times a week	113	22%
4 times a week	79	16%
5 times a week	67	13%
6 times a week	17	3%
1 time a day	77	15%
More than 1 time a day	35	7%

Table7: Respondents' Average Price of their Favorite Beverages

Average price of beverages	Number of Respondents (N = 507)	% of Total Respondents
Below 10 Baht	3	1%
10 Baht	24	5%
12.5 Baht	26	5%
15 Baht	112	22%
17.5 Baht	14	3%
20 Baht	120	24%
22.5 Baht	10	2%
25 Baht	80	16%
27.5 Baht	2	0%
30 Baht	45	9%
32.5 Baht	2	0%
35 Baht	11	2%
37.5 Baht	2	0%
40 Baht	19	4%
More than 40 Baht	37	7%

Table 8: Respondents' Substitute of CSD (Respondents can pick up to 3 choices)

Type of Beverages	Number of Respondents (N = 437)	% of Total Respondents
1. Drinking Water	211	48%
2. Juice and Veggie	124	28%
3. Drinking Yogurt	104	24%
4. Fresh Milk or flavored Milk	86	20%
5. RTD tea	73	17%

Table 9: Respondents' Substitute of Flavored Milk (Respondents can pick up to 3 choices)

Type of Beverages	Number of Respondents (N = 454)	% of Total Respondents
1. Fresh Milk	153	34%
2. Drinking Water	151	33%
3. Soy Milk	142	31%
4. Drinking Yogurt	127	28%
5. Juice and Veggie	83	18%

Table 10: Respondents' Substitute of Energy Drink (Respondents can pick up to 3 choices)

Type of Beverages	Number of Respondents (N = 350)	% of Total Respondents
1. Drinking Water	117	33%
2. Sport Drink	83	24%
3. CSD	66	19%
4. Fresh Milk or flavored Milk	58	17%
5. RTD coffee	45	13%

Table 11: Respondents' Substitute of Sport Drink (Respondents can pick up to 3 choices)

Type of Beverages	Number of Respondents (N = 391)	% of Total Respondents
1. Drinking Water	205	52%
2. Juice and Veggie	97	25%
3. CSD	65	17%
4. Drinking Yogurt	61	16%
5. Fresh Milk or flavored Milk	42	11%

Table 12: Respondents' Substitute of Fruit juice and veggie (Respondents can pick up to 3 choices)

Type of Beverages	Number of Respondents (N = 476)	% of Total Respondents
1. Drinking Water	223	47%
2. Drinking Yogurt	127	27%
3. Fresh Milk or flavored Milk	85	18%
4. Soy Milk	71	15%
5. CSD	45	9%

Table 13: Respondents' Substitute of RTD tea (Respondents can pick up to 3 choices)

Type of Beverages	Number of Respondents (N = 438)	% of Total Respondents
1. Drinking Water	187	43%
2. Street Vendors' Beverages	121	28%
3. Juice and Veggie	92	21%
4. Fresh Milk or flavored Milk	73	17%
5. Drinking Yogurt	59	13%

Table 14: Respondents' Substitute of RTD coffee (Respondents can pick up to 3 choices)

Type of Beverages	Number of Respondents (N = 393)	% of Total Respondents
1. Street Vendors' Beverages	144	37%
2. Drinking Water	124	32%
3. Drinking Yogurt	53	13%
4. Fresh Milk or flavored Milk	52	13%
5. Instant tea/coffee	47	12%

Table 15: Descriptive Statistics for Tax Policy Effectiveness Agreement scaled from 1 to 10

Number of Observations	482
Mean	7.67
Median	8
Mode	10
Standard Deviation	2.05

Table 16: Descriptive Statistics for Maximum Incremental Price

Number of Observations	475
Mean	8.62
Median	5
Mode	5
Standard Deviation	8.44

Table 17: ANOVA Table (Type II Test) with Log of Maximum Incremental Price as Dependent Variables

Variables of Interest	Sum of Square	Df	F-Value	Pr(>F)	
Individual characteristic variables					
Gender	1.129	1	2.33	0.12	
Age	3.71	1	7.65	0.005	**
Income Level	5.322	10	1.1	0.36	
Consumption Behavior variables					
Weekly Consumption Frequency	0.039	1	0.08	0.78	
Average Price of Beverage	13.847	1	28.55	0.00	***
Residuals	186.201	384			

* p-value <0.10 indicating the significance at 10% level

** p-value <0.05 indicating the significance at 5% level

***p-value < 0.01 indicating the significance at 1% level

Table 18: Result of Multivariate Regression with Log of Maximum Incremental Price as Dependent Variables

Variables of Interest	Coefficients	Standard Error	t-value	Pr(>|t|)	
Intercept	1.056	0.252	4.181	0.00	***
Gender-Female	0.114	0.075	1.526	0.13	
Age	0.017	0.006	2.766	0.005	**
Income level: 1,500-3,000 Baht	0.324	0.269	1.205	0.23	
Income level: 3,001-5,000 Baht	0.063	0.232	0.272	0.79	
Income level: 5,001-10,001 Baht	0.179	0.22	0.815	0.42	
Income level: 10,001-15,000 Baht	0.177	0.222	0.797	0.43	
Income level: 15,001-30,000 Baht	0.038	0.221	0.17	0.86	
Income level: 30,001-45,000 Baht	0.153	0.238	0.642	0.52	
Income level: 45,001-65,000 Baht	-0.219	0.284	-0.77	0.44	
Income level: 65,001-85,000 Baht	0.224	0.312	0.72	0.47	
Income level: 85,001-105,000 Baht	-0.275	0.458	-0.604	0.55	
Income level: Above 105,000 Baht	-0.666	0.54	-1.233	0.22	
Weekly Consumption Frequency	-0.005	0.018	-0.283	0.78	
Average Price of Beverage	0.023	0.004	5.344	0.00	***
F-Statistic (14,384)	3.73				
R-Square	0.1197				
Number of Observations	399				

* p-value <0.10 indicating the significance at 10% level

** p-value <0.05 indicating the significance at 5% level

***p-value < 0.01 indicating the significance at 1% level

Table 19: Major Reasons For RTD Beverage Purchase (Respondents can pick up to 3 reasons)

Reasons	Number of Respondents (N = 475)	% of Total Respondents
1. Tastiness	300	63%
2. Convenience	209	44%
3. Thirst-Quenching	177	37%
4. Refreshing	171	36%
5. Price	132	28%

Table 20: Major Reasons For Street Vendors' Beverage Purchase (Respondents can pick up to 3 reasons)

Reasons	Number of Respondents (N = 452)	% of Total Respondents
1. Tastiness	263	58%
2. Convenience	255	56%
3. Price	232	51%
4. Thirst-Quenching	155	34%
5. Refreshing	134	30%

Table 21: Respondents' Decision Under 1st Scenario

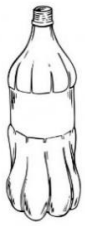
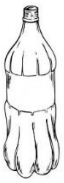
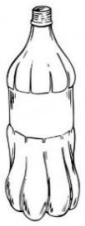
Total Samples = 490 (100%)					
Stop Buying = 11 (2.24%)					
	**Drink**: Favorite **Size**: 330 ml **Price**: 18 Baht		**Drink**: Favorite **Size**: 250 ml **Price**: 15 Baht		**Drink**: Favorite (with Slight Change of taste) **Size**: 330 ml **Price**: 15 Baht
N = 157 (32.04%)		N =204 (41.63%)		N = 118 (24.08%)	

Table 22: Respondents' Decision Under 2nd Scenario

Total Samples = 491 (100%)					
Stop Buying = 40 (8.15%)					
	**Drink**: Favorite RTD **Size**: 185 ml **Price**: 16 Baht		**Drink**: Favorite Locally Produced Beverage **Size**: 185 ml **Price**: 15 Baht		**Drink**: Favorite Locally Produced Beverage **Size**: 350 ml **Price**: 20 Baht
N = 158 (32.18%)		N = 154 (31.36%)		N = 139 (28.31%)	

Table 23: Respondents' Decision Under 3rd Scenario

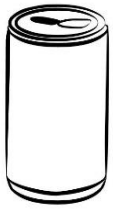
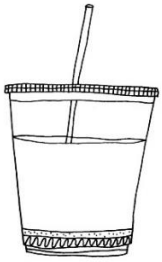
Total Samples = 490 (100%)					
Stop Buying = 64 (13.06%)					
	**Drink**: Favorite RTD **Size**: 185 ml **Price**: 20 Baht		**Drink**: Familiar Locally Produced Beverage **Size**: 185 ml **Price**: 30 Baht		**Drink**: Unfamiliar Locally Produced Beverage **Size**: 350 ml **Price**: 20 Baht
N = 168 (34.29%)		N = 126 (25.71%)		N = 132 (26.94%)	

Table 24: Respondents' Decision Under 4th Scenario

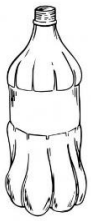
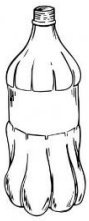
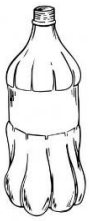
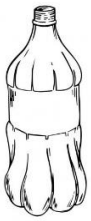
Total Samples = 478 (100%)							
Stop Buying = 33 (6.90%)							
	**Drink**: Favorite **Sugar**: 12% **Price**: 18 Baht		**Drink**: Favorite **Sugar**: 11% **Price**: 17 Baht		**Drink**: Favorite **Sugar**: 10% **Price**: 16 Baht		**Drink**: Favorite **Sugar**: 8% **Price**: 15 Baht
N = 64 (13.39%)		N = 34 (7.11%)		N = 56 (11.72%)		N = 291 (60.88%)	

Figure 6: Example of Choice Task in the Fifth Condition with Convenience Factor

Table 25: Beverages' Attributes and Attributes' Levels in Choice Experiment

Beverages' Attributes	Attributes' Level
Product Type	Ready-to-Drink
	Street Vendors' Drinks
Price	15 Baht
	16 Baht
	17 Baht
	18 Baht
	20 Baht
	25 Baht
	30 Baht
Size	325
	350
	470
	500
	550
	590
Sugar Level	Low Sugar/ Low Calorie
	Normal Sweet Level
Taste or Familiarity	Favorite drink/Usual Vendor
	Substitutes/New Street Vendor
Proximity	3 Steps or Less than 10 meters ahead
	100 meters ahead

Table 26: Analysis of Deviance Table (Type II Wald Chi-Square Tests) with Decision or Probability to Purchase as Dependent Variables (1 = Buy, 0 = Not Buy)

Variables of Interest	Sum of Square	Df	Pr(>F)	
Product Type	68.80	1	0.000	***
Price	7.08	1	0.007	***
Size of Product (10 ml)	13.18	1	0.000	***
Sugar Level	45.07	1	0.000	***
Taste or Familiarity	52.14	1	0.000	***
Proximity	133.03	1	0.000	***
Product Type*Price	18.61	1	0.000	***
Product Type*Size	0.01	1	0.944	***
Product Type*Taste of Familiarity	5.18	1	0.023	**
Product Type*Proximity	0.10	1	0.317	

* p-value <0.10 indicating the significance at 10% level

** p-value <0.05 indicating the significance at 5% level

***p-value < 0.01 indicating the significance at 1% level

Table 27: Fixed Effect of Logistic Mixed Model with Decision or Probability to Purchase as Dependent Variables (1 = Buy, 0 = Not Buy)

Fixed Effects:				
Variables of Interest	Estimate	Std. Error	z-value	Pr(>|z|)
Intercept	2.009	0.759	2.645	0.008***
Local Street Drink (LSD) (0 = RTD, 1 =LSD)	-1.994	0.812	-2.454	0.014**
Price (Baht)	-0.213	0.045	-4.721	0.000***
Size of Product (10 ml)	0.0123	0.005	2.257	0.024**
Regular Sugar Level (Less Sugar = 0, Regular Sugar = 1)	-0.809	0.121	-6.714	0.000***
Unfamiliarity (Favorite Drink = 0 Substitutes = 1)	-0.484	0.113	-4.263	0.000***
Long Distance (3 Steps = 0 100 Meters ahead = 1)	-1.134	0.118	-9.583	0.000***
LSD*Price	0.198	0.046	4.314	0.000***
LSD*Size	0.0005	0.007	0.071	0.944
LSD*Unfamiliarity	-0.354	0.156	-2.276	0.023**
LSD*Long Distance	0.150	0.150	1.000	0.317

* p-value <0.10 indicating the significance at 10% level

** p-value <0.05 indicating the significance at 5% level

***p-value < 0.01 indicating the significance at 1% level