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CONTENTS

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The net benefit of increasing alcohol taxation in Thailand

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Abstract
The purpose of this paper is to calculate the effects of increasing alcohol taxation in Thailand. Standard economic analysis is applied to data from a range of sources. Results suggest that alcohol taxes in Thailand have only a small impact on consumption. Thus an alcohol tax increase results in only a modest rise in deadweight loss and a small reduction in social costs. Increasing the tax rate on alcohol generates higher expenditure and government tax revenue. Overall taxes on alcoholic beverages result in net benefits to the Thai economy.

Keywords: alcohol taxation, social costs, net benefits

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1. INTRODUCTION

Drinking alcohol in moderation may give protection to health (World Health Organisation, 2004), while excessive consumption levels lead to problems of intoxication (drunkenness), alcohol dependence and other biochemical effects. In Thailand, alcohol consumption is a cause of acute and chronic problems. Alcohol consumption has been attributed to the death of 20 842 people or 8.6 per cent of overall deaths in 2012 (Centre for Alcohol Studies, 2013). If the number of deaths is converted to the number of year life loss (YLL), it is over 400 000 years or 11 per cent of total YLL. Alcohol consumption also causes chronic conditions among drinkers, who accumulate disabling conditions – over 500 000 years or 24 per cent of years of life disability (YLD) in 2012 (Centre for Alcohol Studies, 2013).

In economic theory, consumers are assumed to weigh the personal benefits and costs when purchasing goods and services. They buy goods and services when the benefits outweigh the costs of consumption. Alcoholic beverages are like any other commodities. Drinkers gain satisfaction and enjoyment when consuming alcoholic beverages. The amount of alcohol consumed continues rising as long as the satisfaction and enjoyment from an extra unit exceeds the price paid, including possible adverse occurrences (eg, death and disability) taking place. Whether responsible or problem drinkers consume alcoholic beverages, all are regarded as gaining benefits from alcohol consumption (Jha and Chaloupka, 1999).

It can be said that most drinkers, especially heavy drinkers, do not appropriately take into account the social costs incurred in alcohol consumption. The consequences of harmful use of alcohol are partly borne by other people in any given society. Those supporting greater taxing of alcoholic beverages wish to reduce the adverse effects of excessive alcohol consumption, which, in turn, leads to a reduction in private and social costs (Pogue and Sgontz, 1989). The opposing view points out that, although a higher tax rate can decrease alcohol consumption by heavy drinkers, responsible drinkers are also indiscriminately impacted on, which results in a reduction in satisfaction gained by drinkers as a whole.

Alcohol taxes should have a role in addressing spillover costs on societies associated with alcohol abuse (Australian Government Treasury, 2015). It is argued that an individual with abusive consumption should have a cost (tax) be imposed on a per-drink basis, at the rate equal to the cost of harmful drinking imposed by the individual consumer. This could reduce the amount consumed by heavy drinkers who give rise to the costs.

In fact, excise tax on alcoholic beverages cannot work in the situation described above because it is levied equally on all alcohol consumers. To deal with alcohol abuse, tax increases cause consumers to face higher prices, while it would not target those who are most likely to cause social harm. Non-abusive drinkers are affected by reducing their well-being.

Although there is a large volume of literature for many highly developed countries, the effects of alcohol and the impact of tax policy on alcohol consumption on a newly industrialised country, such as Thailand, is relatively little researched. This paper attempts to redress this somewhat and aims to investigate the effects of alcohol excise taxes in Thailand and whether they make Thai society better or worse off. Section two describes the literature on the estimation of economic cost of alcohol consumption.

Section three explains the methods used to calculate the levels of consumption, deadweight loss, total expenditure, total government revenue, total consumer surplus and total net benefits. Section four describes the data used in estimating the amount consumed by heavy drinkers. Section five presents the results derived from simulating tax rate rises of, respectively, 5 and 10 per cent under assumed price elasticity estimates. Section six draws conclusions from the analysis.

2. ESTIMATING ECONOMIC COST OF ALCOHOL CONSUMPTION

The traditional economic approach assumes that people are rational agents who maximise their own individual welfare (Lightwood et al, 1999). If drinkers know all the information regarding health risks from alcohol consumption and they pay the full cost of health care, they will not over-consume amounts of alcohol because they will include these private costs in their decision on how much to consume. However, in most cases, they do not bear the cost to society of health risks. For alcoholic beverages, costs are regarded both as negative externalities and private costs because of mistaken decisions arising from imperfect information. This means both society and individuals bears the cost of alcohol consumption.

Manning et al. (1989) distinguished internal and external costs and stated the goal of an economically efficient tax on drinking should make drinkers bear the costs that they impose on others when deciding how much to drink, ie. internalising the externality. However, there is disagreement on whether individuals pay taxes equal to the full costs needed to compensate those who actually bear the final cost.

Measuring externalities is complicated. For example, a drunk driver is unlikely to bear the full costs to societies for his action (Gruber, 2011). Given the issue of the measuring costs (external or internal) of drivers, the Cost of Illness (COI) has been developed to estimate total external and private costs, including the costs of lost earnings and suffering experienced by abusers. Taxes should rise to reflect total costs of consumption by abusers rather than just pure external costs, as it depends on how broadly or narrowly external costs (who does activities, where and under what circumstances) are defined. Accordingly, costs do not only consist of the damage caused by the alcohol consumers to societies, but also the damage they cause to themselves. In addition, the COI framework differs from the neoclassical economics approach because it only considers the expenses incurred by private and public agents without looking at the benefits of alcohol consumption.

This study considers the costs of alcohol consumption based on the COI approach and evaluating the effects of rising alcohol taxes on both costs and benefits to Thai society.

The study of the economic costs of substance abuse usually involves a survey, such as the COI study that shows the extent of the impact of substance abuse on the welfare of a society (Single et al, 2003). This is estimated by examining the costs of resources expended on treatment, prevention, research and law enforcement plus losses of production due to increased morbidity and mortality and plus some measure for the quality of life, years of life lost relative to a counterfactual scenario in which there is no alcohol abuse using the international guidelines for estimating the costs of substance abuse (Single et al, 2003). The COI also links to the concept of burden of disease which is defined as the gap between current health status and an ideal situation

in which everyone lives to old age free of disease and disability (World Health Organisation, 2004).

Excessive alcohol consumption generates adverse health effects and social consequences. These are associated with health care (liver cirrhosis, cancers and foetal alcohol spectrum disorder); society productivity (premature death and lost worker productivity); criminal justice (violent crime); increasing costs for society services (property damage from fire and motor vehicle crashes) (Jarl et al, 2008) decreasing quality of life for both drinkers and families measured by Disability Adjusted Life Years (DALYs). They measure the overall burden of disease for a given population by summing years of life lost due to premature mortality as well as years of life lost due to time lived in less than full health (World Health Organisation, 2004).

The Alcohol Attributable Fractions (AAFs) are commonly expressed as a number of diseases attributable to alcohol consumption (World Health Organisation, 2004). Each AAF measures the average proportion of the occurrence of a disease attributable to drinking. Liver cirrhosis is a high risk with alcohol consumption and depends upon the volume of drinking. It is important to note that there are many diseases that are attributable to alcohol, but few of them are fully attributable to alcohol (World Health Organisation, 2004). The diseases fully attributable to alcohol include alcoholic psychoses, alcohol-dependence syndrome and alcohol abuse etc.

The AAFs can be derived by direct and indirect ways. The direct estimates are related to most acute problems, for example road accidents for which drivers are tested for the degree of blood alcohol concentration (World Health Organisation, 2004). On the other hand, indirect estimates are related to most chronic diseases which have been analysed using meta-analyses combining country-specific diseases. The AAFs are estimated by the demographic structure, general health, drinking habits and history of the population and the characteristics of drinkers. Finally, these estimates are used to calculate healthcare costs etc.

The general issues in estimating costs of alcohol consumption are as follows. First, most studies require the choice of discount rates because they mostly report the estimated costs of substance abuse over a particular period of time. Discount rates used in calculating indirect costs are different in a number of studies (Jarl et al, 2008;Konnopka and Konig, 2007;Nakamura et al, 1993) and the actual cost estimates can be sensitive to the chosen discount rate. Most literature adopts a range of discount rates of between 2 and 10 per cent. Second, there is an issue of whether to include future expected costs. For example, decreased life expectancy of drinker relates persons who die early will reduce healthcare costs, but a government will receive less tax revenue.

Third, there is an issue of computing gross versus net costs. The gross costs are defined as all costs of treating attributable diseases (Lightwood et al, 1999). The net costs are a comparison of the life costs of drinkers versus those of non-drinkers. They take account of the fact that drinkers tend to die younger than non-drinkers and then avoid some health care costs and forego some pension benefits in old age.

Fourth, there are different viewpoints of how costs are reported. Gross costs are reported in terms of aggregate costs (assuming fixed population and drinking prevalence), for instance as a fraction of the Gross Domestic Product (GDP). Another

way of reporting costs is as the cost per unit of alcohol consumed (Manning et al, 1989).

Literature on estimating costs of alcohol consumption has applied AAFs under two main methodologies. A widely used methodological approach employed in estimating cost of alcohol consumption is the prevalence-based approach. In deriving the cost of health care, this approach estimates the number of cases of death and hospitalisations attributable to alcohol consumption in a given year, the costs that flow from death and hospitalisations and costs of prevention, research and law enforcement (Single et al, 2003). This method relates current costs to the extent of all current and past drinking. The prevalence-based approach is considered as cross-sectional approach.

An alternative method that is used in studies is called the incidence-based approach. The incidence-based approach estimates the number of new cases of deaths and hospitalisations in a given year and applies a lifetime cost estimate to these new cases. This approach is also known as the life-cycle approach. The approach calculates costs for drinkers and non-drinkers over their entire expected lifetimes. The estimated lifetime costs of the existing population of drinkers and non-drinkers are compared with the hypothetical non-drinkers population. The estimates of current and future costs that flow over time are used to calculate the net present value.

There have been studies of economic costs of alcohol consumption, mainly from developed countries. They have calculated costs of alcohol consumption by applying the age and gender specific AAFs. Studies that have applied the AAFs with either prevalence- or incidence-based approaches under the COI framework are described below.

Konnopka and Konig (2007) used the prevalence-based approach with age- and gender-specific AAFs for morbidity and mortality to estimate the direct and indirect costs of attributable risks to alcohol consumption in Germany in 2002. The AAFs for morbidity and mortality were calculated from prevalence of alcohol consumption of survey participants aged 18–59 years and relative risk data obtained from international studies. Those aged more than 59 years were assumed to have the same prevalence as those aged 50–59 years. In their study, the AAFs for morbidity and mortality included a number of selected diseases. Alcohol consumption was estimated to account for 5.5 per cent of all deaths and 970 000 years of potential life loss. Total costs were estimated to be €24 398 million, amounting to 1.16 per cent of GDP. Direct medical and non-medical costs were €8441 million. Indirect costs were €15 957 million (69 and 31 per cent, respectively, for mortality and morbidity). In contrast, the authors reported that low level of alcohol consumption (no more than four standard drinks on any single day for men and women, but can cause problems if drinkers drink too quickly, have health problems or are old) contributed protective health effects, saving €4439 million a year.

Nakamura et al. (1993) estimated the economic burden of alcohol abuse in Japanese society in 1987. The overall cost of alcohol abuse was estimated at ¥6600 billion, representing 1.9 per cent of the GDP. The attributable costs of medical care were estimated at ¥1100 billion, representing 6.9 per cent of total national medical expenditure. The attributable mortality costs were estimated at ¥900 billion. Reduced productivity related to alcohol abuse was estimated at ¥4300 billion. The number of alcohol attributable deaths was 21 015 in men (5.1 per cent of total male deaths) and 8173 in women (2.4 per cent of total female deaths).

Jarl et al. (2008) estimated the societal cost (direct, indirect and intangible) of alcohol consumption in Sweden in 2002 and the effects on health and quality of life using the COI methods. The AAFs for some chronic diseases and accidents are wholly attributable to alcohol. Alternatively, the AAFs for some chronic diseases are derived by information on the prevalence of consumption and the relative risk of diseases, number of deaths and health care episodes attributable to alcohol consumption. The net cost was 20.3 billion Swedish kronor (SEK), accounting for 0.9 per cent of GDP and the gross cost (counting only detrimental effects) was 29.4 billion, 1.3 per cent of GDP. The main direct costs were health care costs (2189 million), social service costs (4364 million) and crime costs (2850 million). The majority of productivity costs include mortality (3069 million), long-term sickness absence (3167 million), early retirement (2423 million) and short-term sickness absence (1175 million). Additionally, a net loss of YLL plus YLD from alcohol consumption was estimated to be 121 800 years.

Fenoglio et al. (2003) made use of death or hospitalisation records for France in 1997 and employed pooled relative risk estimates from meta-analyses combined with prevalence data by age and gender. The proportion attributable to alcohol is then used to estimate the cost of alcohol consumption. Alcohol consumption gave rise to total cost of ₣115 billion (francs) (1.4 per cent of GDP) and represented more than half of the social cost of drugs. The greatest share of total cost was lost productivity (₣58 billion) followed by costs due to premature death (₣53 billion), morbidity (₣3.8 billion) and imprisonment (₣503 million) respectively.

Bouchery et al. (2011) measured the economic costs of excess drinking in the USA in 2006 using the US Public Health Service Guidelines. Alcohol-attributed deaths and years of potential life loss due to excessive alcohol consumption were estimated by recently updated data from Alcohol Related Disease Impact (ARDI) survey. The estimated economic cost of excessive drinking was US$223.5 billion (72.2 per cent from lost productivity, 11 per cent from health care costs, 9.4 per cent from criminal justice costs and 7.5 per cent from other effects). In addition, binge drinking resulted in US$170.7 billion (76.4 per cent of the total), underage drinking US$27 billion, and drinking during pregnancy US$5.2 billion. Also the cost to government was US$94.2 billion (42.1 per cent of the total).

Collins and Lapsley (2008) estimated the social costs of alcohol in Australia in 2004/05. Total costs were estimated to be A$15.3 billion: tangible costs accounted for A$10.8 billion and intangible cost for A$4.5 billion respectively. The individual categories of tangible costs consisted of labour costs (total of A$3538 million from the sum of reduction in workforce (A$3210.7 million), absenteeism (A$367.9 million), premature death (A$1423.9 million) and sickness (A$146.9 million), less consumption resources saved (A$1611.3 million)); healthcare costs (total of A$1976.7 million from medical (A$540.7 million), hospital (A$662.2 million), nursing homes (A$401.2 million), pharmaceuticals (A$297.6 million) and ambulances (A$74.8 million)); cost of road accidents (A$2202 million) and crime costs (total of A$1424 million from police (A$747.1 million), criminal courts (A$85.8 million), prisons (A$141.8 million), property (A$67.1 million), insurance administration (A$14.3 million) and productivity of prisoners (A$368 million) and resources in abusive consumption (A$1688.8 million)). For intangible costs of alcohol, pain and suffering (road accidents) and the value of loss of a year's living was estimated to be A$353.6 and A$4488.7 million respectively. The burden of alcohol was split among

households (A$2558.2 million), business (A$5576.3 million) and government (A$2923.2 million).

Luce and Schweitzer (1978) adopted a cross-sectional approach for the USA in 1976 with disease specific AAFs for neoplasms, circulatory system, respiratory system, fire losses, motor vehicle accident losses, costs of violent crime to estimate gross costs of alcohol abuse in the USA. The total estimated costs were US$44.2 billion, which corresponded to US$20.6 billion for lost earning, US$11.9 billion for direct healthcare costs, US$0.38 billion for fire losses, US$6.6 billion for motor vehicle accident losses, US$2.1 billion for cost of violent crime and US$2.7 billion for cost of certain social responses.

Single et al. (1998) used death and hospitalisation records due to substance abuse in Canada in 1992. The total cost of misuse of alcohol in Canada was estimated to be approximately C$7.52 billion, consisting of C$4.14 billion for lost productivity, C$1.36 billion for law enforcement and C$1.3 billion in direct health care costs respectively.

Further, two of the papers above consider who bears the burden of cost of alcohol consumption (Bouchery et al, 2011;Fenoglio et al, 2003). In 2011, Bouchery et al. noted that governments, heavy drinkers and families bear the costs of drinking in equal proportions. By contrast, Fenoglio et al. (2003) reported that households and private companies share greater proportions, 45 and 40 per cent of the total cost of drinking respectively, while around 15 per cent of the cost is borne by the government.

Alcoholic beverages are popular among many in the Thai population. The trend of adult per capita alcohol consumption rose from less than one litre of pure alcohol in 1961 to six litres of pure alcohol by 1980 and the amount consumed per capita remained above six litres over the period of 1980–2009. Although the alcohol consumption per capita is not as high as the amount consumed in high income countries, Thailand has been considered as a country with high adult per capita alcohol consumption relative to other nations in South East Asia; and this consumption has resulted in increased alcohol-related problem in the Thai society. According to the World Health Organisation (2011) database, in the Philippines alcohol consumption was 4.77 litres per capita in 2000 and fell to 4.6 litres per capita in 2009. In Singapore, 2.08 litres per capita alcohol consumption was reported in 2001, and 1.99 litres were consumed per capita in 2010. In Vietnam, there has been a rising trend of alcohol consumption, from 0.7 litres per capita to 1.88 litres per capita during 2000–2009.

Thavorncharoensap et al. (2010) relied on the COI framework and data on the number of in-patient admissions, out-patient visits and unit costs as well as applying AAFs (disease attributable to binge consumption for calculating health care cost) to estimate the economic costs of alcohol consumption in Thailand in 2006.

Total costs of alcohol consumption were estimated to be approximately 156 billion baht (THB) or about 2 per cent of the total GDP, of which THB104, 45 and 5 billion were the highest three costs generated, the costs of productivity loss due to premature mortality, the costs of reduced on the job productivity and the health care costs respectively. Other costs include THB0.8 billion for property damage due to traffic accidents, THB0.2 billion for court costs and THB0.1 billion for police costs.

Total external costs of alcohol consumption were estimated to be THB156 billion in Thailand in 2006 (Thavorncharoensap et al, 2010). This amount adjusted for inflation is THB167 billion in 2009. Cost of premature mortality is the largest component, amounting to THB111 billion. Cost of reduced productivity and health care costs are the second and third largest items, amounting to THB48.6 and 5.87 billion. Cost of property damage due to traffic accidents, court costs and police costs are equal to THB0.83, 0.17 and 0.09 billion respectively.

The above studies suggest that alcohol consumption imposes significant costs on individuals and society. There is therefore the potential for taxes on alcohol to reduce these costs by reducing consumption. However, the prevalence of alcohol consumption suggests that increased taxes also would reduce benefits to consumers. The following analysis seeks to estimate the net effects of increasing taxes on alcohol in Thailand.

3. METHOD

The method employed to measure the effect of changes in alcohol taxes is to calculate the impacts on consumption, consumer surplus, costs and taxation revenue.

Consumption after an increase in tax is calculated by:

$$Q_2 = Q_1 + \Delta Q$$

Change in consumption or $\Delta Q = \in (P_2 - P_1)/P_1$

Where $\in = \Delta Q/Q \div \Delta P/P$ is price elasticity of demand, $Q_2$is quantity consumed after a tax rise, $Q_1$is quantity consumed before the tax rise, P_2 is price after tax and P_1 is price before tax.

Consumer surplus (CS) is defined as the difference between the amount that consumers are willing to pay and the amount they actually pay:

$$\Delta CS = \frac{1}{2}(Q_2 + Q_1)(P_2 - P_1)$$

Deadweight loss is defined as the net loss of consumer and producer surplus associated with any increase in tax rates. In measuring excess burden, the Harberger Triangle has been adopted as for calculating the cost of alcohol excises (Harberger, 1974). Since all the tax is assumed to be passed on in higher prices there is no change in producer surplus.

$$DWL = \frac{1}{2}T\Delta Q$$

Where $T = P_2 - P_1$is tax imposed and ΔQ is the change in quantity consumed of alcoholic beverages.

Total expenditure, TE, is

$$TE = P_2 \times Q_2$$

Where TE is total expenditure, P_2 is price paid after a tax rise and Q_2 is quantity consumed after the tax rise.

Increase in tax revenue is:

$$\Delta T = t_2 Q_2 - t_1 Q_1$$

Where ΔT is increase in tax revenue, t_2 is new tax rate, t_1 is old tax rate, Q_2 is quantity consumed after tax and Q_1 is quantity consumed before tax.

Total net benefit after an increase in tax refers to changes in expenditure plus a reduction in costs (both private and external) minus deadweight loss.

$$TB = TE + \Delta External\ costs + \Delta T(\Delta CS + \Delta PS)$$

Since $\Delta CS + \Delta PS = \Delta T + Deadweight\ loss$

$$TB = TE + \Delta External\ costs - Deadweight\ loss$$

4. DATA

To estimate total benefits of increasing alcohol taxation we simply need total expenditure (after tax), the change in external costs and deadweight loss. We first need to know prices of alcohol both before and after tax. The 2009 Socio-Economic Survey of Thailand provides household expenditure on alcohol (National Statistics Office, 2009). Quantity consumed of alcohol is available from the databases of the WHO (World Health Organisation, 2011). Prices of alcoholic beverages can be calculated from the existing expenditure and quantity consumed (National Statistics Office, 2009;Tax Planning Division, 2012;World Health Organisation, 2011).

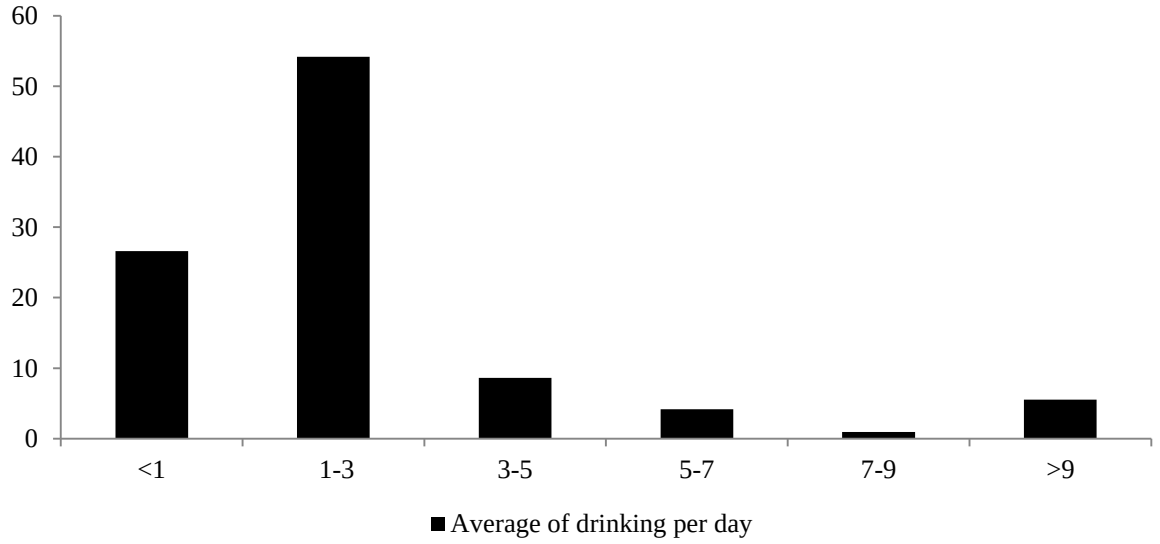
Our derived prices of alcoholic beverages are the price inclusive of excise taxes and need to be separated into prices before tax and prices after tax. The ratio of tax to price is calculated by using total government revenue as a proportion of total expenditure. THB161.66 per litre is the price of alcohol before tax. Tax per litre of pure alcohol is calculated to be THB301.2 per litre. Thus, price of alcohol after tax is THB462.86 per litre.

Our estimated demand elasticities are taken from the study of Chonviharnpan and Lewis (2015), where the price elasticity of demand for alcoholic beverages was estimated to be -0.25.

Total estimated cost of alcohol consumption is approximately THB167 billion, adjusted for inflation (Thavorncharoensap et al, 2010).

The amount of alcohol consumed by heavy drinkers is calculated by using the Alcohol Drinking Reports for 2007 (National Statistics Office, 2007). These two reports contain the information on the numbers of abusive drinkers. They also report the number of drinkers based on average of drinking per day and type of unit (glasses). Our study uses the definitions of heavy drinker based on the published documents of the WHO.

Figure 1: Average drinking per day in litre, 2007 (per cent)



Source: National Statistics Office (2007)

The 2007 report of alcoholic drinking behaviour in Thailand has shown the distribution of drinkers in terms of amounts of alcohol drinking per day. From Figure 1, the trend shows there are few drinkers who consume at greater amounts of alcohol per day on the average, for example five glasses or more per day on the average. There is evidence of greater proportions of drinkers with nine glasses and over compared with those five to seven glasses and seven to nine glasses. The survey shows that majority of drinkers consume one to three glasses per day on the average. This is followed by drinkers who consume less than one glass per day and three to five glasses per day respectively.

In order to calculate the average of alcohol drinking per day, we make use of data on several types of units (glasses) provided by the survey of alcoholic drinking behaviour in 2007. The detail is as follows:

1. shot (30 cc)
2. small bottle/wine glass (150 cc)
3. can/middle size bottle (300–350 cc)
4. big size bottle (600–750 cc)
5. glass no1 (200 cc)
6. glass no. 2–3 (230 cc)
7. glass no. 3 (285 cc) and
8. glass no. 4–5 and no. 6–8 (325 cc)

We multiply various units (glasses) above by number of unit consumed per day, ie:

1. less than 1 unit
2. 1 unit but less than 3 units
3. 3 units but less than 5 units
4. 7 units but less than 9 units and
5. over 9 units

and also multiply by number of drinkers from various groups given in this report.

A heavy drinker is defined as a person who consumes 60 or more grams of pure alcohol per drinking occasion and drinks at least a day monthly (World Health Organisation, 2004;2014). Sixty or more grams of pure alcohol is approximately 1300 cc of beer drinking per day or 200 cc of whisky drinking per day (Assanakornchai et al, 2000). We make use of the data on the number of drinkers, the minimum amount consumed and types consumed to find the amounts consumed by heavy drinkers as a proportion of total consumption. According to the distribution of overall Thai drinkers (Figure 1), our assumed number of heavy drinkers is around 8 per cent of the overall drinkers and consume approximately 19 per cent of total amount of alcohol (per day on the average).

We attempt to incorporate some sensitivity to our analysis to account for the assumption that heavy drinkers have different responses to tax increases and account for more of the costs of alcohol consumption. We do not have an estimate of price elasticity for heavy drinkers. However, since our estimated price elasticity of demand for the whole population is -0.25, the estimates of heavy drinkers should be lower than this. The reason for this is that the heavy drinkers are less responsive to price changes compared with responsible drinkers. Therefore, the amount consumed by heavy drinkers is estimated by using two price elasticities, namely, -0.1 and -0.25. This higher value assumes heavy drinkers have the same price elasticity as regular drinkers.

5. EMPIRICAL RESULTS

This present study is based on, respectively, 5 and 10 per cent tax increases. Using the modest tax rates to investigate the behaviour of demand given tax changes is more appropriate than an increase in price at an extreme level.

Table 1 presents the effects of alcohol tax increases of 5 and 10 per cent on changes in consumption, deadweight loss, expenditure, government revenue, consumer surplus and net benefit. These are calculated based on the current tax revenue and consumption of alcoholic beverages, given our -0.25 price elasticity of demand for alcoholic beverages. In 2009, the Royal Thai Excise Department reported that alcohol tax revenue and consumption was approximately THB89.87 billion and 298.38 million litres of pure alcohol, respectively. In that year, the average tax rate was around 65 per cent on beer, liquor and wine.

Table 1: Estimated change in benefit of alcohol consumption

	Change in tax rate in per centage	
	5	**10**
Increase in price in baht per litre (THB/L)	15.06	30.12
Decrease in consumption in million litres (ML)	2.43	4.85
Change in deadweight loss in billion baht (bnTHB)	-0.02	-0.07
Increase in expenditure (bnTHB)	3.33	6.59
Increase in government revenue (bnTHB)	4.46	8.84
Change in consumer surplus (bnTHB)	-4.48	-8.91
Total change in benefit (bnTHB)	3.31	6.52
Decrease in external costs (bnTHB)	1.36	2.71
Increase in net benefit (bnTHB)	4.67	9.23

Note: It is assumed here that heavy drinkers have the same price elasticity of demand as responsible drinkers.

Now consider that in increasing alcohol tax rates by 5 and 10 per cent, prices are increased by THB15.06 and 30.12 per litre, respectively. With the new prices, consumption falls by 2.43 and 4.85 million litres. A 5 per cent increase in the tax rate causes a reduction in economic surplus, known as the deadweight loss, amounting to THB0.02 billion. The price rise through 10 per cent tax increase will greatly increase deadweight loss to THB0.07 billion. Tax is regarded as an efficient instrument as the changes in the deadweight loss relative to expenditure is very small.

A 5 per cent increase in tax will increase total expenditure by THB3.33 billion and the Royal Thai Government (via the Excise Department) will gain an additional THB4.46 billion in tax revenue. Increasing the tax rate by 10 per cent nearly doubles the increase in total expenditure and taxation revenue compared to a 5 per cent tax increase. For tax increases of 5 and 10 per cent, consumers experience a fall in consumer surplus of THB4.48 and 8.91 billion, respectively; part of which becomes increased tax revenue for the government and part is deadweight loss.

As excise taxes on alcoholic beverages are increased by 5 and 10 per cent, respectively, total external costs, assuming all drinkers bear total costs, fall by THB1.36 billion (2.43 million litres at THB558.98 per litre) and THB2.71 billion (4.85 million litres at THB558.98 per litre). These are equivalent to 1.2 and 2.5 per cent of total costs but are high proportionally to the deadweight loss. These numbers are also less than the increase in alcohol tax revenues. Finally, total benefit grows by THB4.67 and 9.23 billion, respectively, indicating that Thai society gains a net benefit from increasing alcohol taxes.

Table 2: Estimated decrease in cost of alcohol consumption (billion baht)

	Change in tax rate in per centage	
	5	**10**
Health	0.048	0.095
Court	0.0014	0.0027
Police	0.0008	0.0015
Traffic accident	0.0068	0.014
Loss premature mortality	0.9	1.81
Productivity loss	0.4	0.79
Total external costs	1.36	2.71

Note: It is assumed heavy drinkers have the same price elasticity of demand as responsible drinkers.

Table 2 presents estimates of the impact of alcohol tax increases of 5 and 10 per cent, respectively, on various costs. As alcohol consumption falls, private and social costs of alcohol also decline. In this case, drinkers reduce their own costs by reducing alcohol consumption and partially bear the costs of externalities by paying higher prices.

There have been proportionately larger reductions in costs of due to premature mortality, productivity loss and heath care compared with costs of traffic accidents, court and police. The loss due to premature mortality is the largest cost reduction, accounting for THB0.9 and 1.81 billion or 67 per cent of the reduction in total external costs. The reduced productivity loss is the second largest savings, equivalent to 0.4 and 0.79 billion baht or 29 per cent of the reduction in total external costs. Health care costs are reduced by THB0.048 and 0.095 billion, respectively. The reduced cost of property damage due to traffic accidents, court costs and police costs are also relatively small.

Table 3: Estimated change in benefit of alcohol consumption, for light drinkers only

	Change in tax rate in per centage	
	5	**10**
Increase in price (THB/L)	15.06	30.12
Decrease in consumption (ML)	1.96	3.92
Change in deadweight loss (bnTHB)	-0.015	-0.06
Increase in expenditure (bnTHB)	2.69	5.33
Increase in government revenue (bnTHB)	3.6	7.14
Change in consumer surplus (bnTHB)	-3.61	-7.2
Total change in benefit (bnTHB)	2.68	5.27
Decrease in external costs (bnTHB)	0	0
Increase in net benefit (bnTHB)	2.68	5.27

Drinkers who consume less than three glasses of alcoholic beverages per day are viewed as light drinkers. These consumers account for approximately 81 per cent of total alcohol consumption. Table 3 presents the effects of alcohol tax increase of 5 and 10 per cent on various economic indicators for light drinkers only. As a consequence, tax increases cause consumption and consumer surplus to fall, but expenditure, tax revenue and net benefit to rise, assuming these responsible drinkers impose no external costs. There is a falling deadweight loss given its small proportion to increased expenditure, while falling consumption due to a tax rise reduces the impact on benefits.

Table 4: Estimated change in benefit of alcohol consumption of 5 and 10 per cent tax increase, under different price elasticities of heavy drinkers only

	Change in tax rate in per centage			
	5		**10**	
Price elasticity of demand	0.1	0.25	0.1	0.25
Increase in price (THB/L)	15.06	15.06	30.12	30.12
Decrease in consumption (ML)	0.19	0.47	0.37	0.93
Change in deadweight loss (bnTHB)	-0.0014	-0.0035	-0.0056	-0.014
Increase in expenditure (bnTHB)	0.775	0.64	1.54	1.27
Increase in government revenue (bnTHB)	0.862	0.857	1.717	1.701
Change in consumer surplus (bnTHB)	-0.863	-0.861	-1.724	-1.715
Total change in benefit (bnTHB)	0.774	0.638	1.54	1.25
Decrease in external costs (bnTHB)	0.54	1.36	1.09	2.71
Increase in net benefit (bnTHB)	1.32	1.99	2.62	3.97

Note: It is assumed heavy drinkers have, alternatively, -0.1 and -0.25 price elasticities of demand.

Table 4 shows the effects of increasing alcohol taxation of 5 and 10 per cent, respectively, with either -0.1 or -0.25 price elasticities of demand for alcoholic beverages among heavy drinkers. When the alcohol tax rate is increased by 5 per cent, the price increases THB15.06 per litre which causes a modest decrease of 0.19 million litres for drinkers with -0.1 price elasticity of demand compared with a large decrease of 0.47 million litres for those with -0.25 price elasticity of demand. Drinkers with the lower price elasticity of demand for alcoholic beverages are obviously less responsive to price change than those with the higher price elasticity of demand. For Table 4, a 10 per cent tax increase with price elasticity of demand of -0.25 produces greater effects shown by each indicator. The alcohol tax increase imposes a deadweight loss ranging from THB0.0014 billion for the first group and THB0.0035 billion for the second group. Here, the small reduction in consumption results in lower deadweight loss, showing the efficiency of excise alcohol taxation.

Since heavy drinkers (with the lower elasticity) are less sensitive to price changes compared to other drinkers, the change in total expenditure, amounting to THB0.775billion,is greater. For given changes in total expenditure, the Royal Thai Government collects additional tax of THB0.862 billion. The consumer surplus declines somewhat because heavy drinkers are more willing to pay a higher price with little effect on consumption. The amount lost in consumer surplus is transferred to tax revenue and deadweight loss.

Alcohol tax increases reduce in total costs of alcohol consumption by only THB0.54 billion compared to THB1.36 billion if demand for heavy drinkers was as elastic as demand for drinkers as a whole. Alcohol tax increases also reduce total costs (private and external), outweighing the deadweight loss. Total net benefits estimates increase from THB1.32 billion to THB1.99 billion, under the assumption that heavy are less sensitive to price changes.

Table 5: Estimated decrease in cost of alcohol consumption of tax increase (billion baht)

	Change in tax rate in per centage			
	5		**10**	
Price elasticity of demand	0.1	0.25	0.1	0.25
Health	0.019	0.048	0.038	0.095
Court	0.00054	0.0014	0.001	0.0027
Police	0.0003	0.0008	0.0006	0.0015
Traffic accident	0.0027	0.0068	0.0054	0.014
Premature mortality	0.36	0.9	0.72	1.81
Productivity loss	0.16	0.4	0.32	0.79
Total external costs	0.54	1.36	1.085	2.71

Table 5 shows the estimated decrease in total external costs with respect to the change in 5 per cent alcohol tax with assumed -0.1 and -0.25 price elasticity estimates for heavy drinkers. Falling consumption produces a reduction in total costs of between THB0.54 billion and THB1.36 billion. The top cost reduction is the cost of premature mortality, varying from THB0.36 billion to THB0.9 billion. The alcohol tax increase reduces cost of productivity loss from between THB0.16 billion and THB0.4 billion. This rising tax rate also reduces health care cost by between THB0.019 billion baht and THB0.048 billion. There are smaller reductions in cost of property damage due to traffic accidents, court costs and police costs associated with alcohol-related harm as well.

In general, the premature mortality and productivity loss are estimated to account over 95 per cent of the decline in external costs.

6. CONCLUSION

This paper aims to estimate the benefits and costs of alcohol consumption given increases in alcohol taxation. The estimates in this paper are for consumption of alcoholic beverages, deadweight loss, total expenditure, tax revenue, consumer surplus and total net benefits. The estimates make use of estimated price elasticities of demand for alcoholic beverages, the data from the 2009 Socio-Economic Survey of Thailand and the report of alcohol drinking published by the National Statistics Office, Thailand, consumption data from the database of the WHO, alcohol tax revenue and quantity data from the Excise Department of Thailand and the estimated cost of alcohol consumption per unit from the study of Thavorncharoensap et al. (2010).

The main findings are that the effects of increasing alcohol taxation result in deadweight loss, increased total expenditure, increased tax revenue, increased total net benefits and reduced costs (ie. cost of premature mortality, cost of productivity loss and health care costs).

Assuming different price elasticities of demand among heavy drinkers, it is evident that the lower the price elasticity of demand, the less reduction in consumption, deadweight loss and total net benefits, but the more total expenditure and tax revenue is generated.

It is noted that an increased tax rate would result in a significant increase in tax revenue for the Royal Thai Government. Alcohol taxation in Thailand is a powerful policy measure for generating higher government revenue, but does not greatly reduce consumption.

The net effects are that increases in alcohol taxes increase the welfare for Thai society even if there is a change in consumer surplus (all increases in deadweight loss are offset by the greater reduction in the external costs).

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