



Published in final edited form as:

Prev Med. 2017 December ; 105 Suppl: S4–S9. doi:10.1016/j.ypmed.2017.05.027.

Changes in cigarette prices, affordability, and brand-tier consumption after a tobacco tax increase in Thailand: Evidence from the Global Adult Tobacco Surveys, 2009 and 2011

Muhammad Jami Husain^{a,*}, Deliana Kostova^a, Lazarous Mbulo^a, Sarunya Benjakul^b, Mondha Kengganpanich^b, and Linda Andes^a

^aUS Centers for Disease Control and Prevention (CDC), Atlanta, GA, USA ^bFaculty of Public Health, Mahidol University, Bangkok, Thailand

Abstract

Despite the 2009 implementation of a tobacco tax increase in Thailand, smoking rates remained unchanged between 2009 and 2011. Prior evidence has linked cigarette tax increases to compensatory behaviours aimed at lowering the cost of smoking, such as switching to lower-priced cigarette brands. Using data from 2009 and 2011 Global Adult Tobacco Surveys in Thailand, we estimated unadjusted changes in cigarette prices paid, cigarette affordability, and consumption of cigarettes in three price categories classified as upper-, middle-, and lower-priced brand tiers (or price tertiles). We used ordered logit regression to analyse the correlates of price-tier choice and to estimate the change in price-tier consumption adjusted for demographic and region characteristics. Between 2009 and 2011, real cigarette prices increased, but the affordability of cigarettes remained unchanged overall. There was a significant reduction in the consumption of cigarette brands in the top price-tier overall, accompanied by increases in the consumption of brands in the bottom and middle price-tiers, depending on the region. Adjusted estimates from the logit models indicate that, on average, the proportion of smokers selecting brands from upper- and middle price-tiers decreased while consumption of lower price-tier brands increased during the study period. The estimated shifts in consumption from more expensive to less expensive cigarette brands and the overall lack of change in cigarette affordability in Thailand between 2009 and 2011 are both factors that may have contributed to the observed lack of change in smoking rates after the 2009 tax increase.

*Corresponding author at: Global Noncommunicable Disease (NCD) Branch, Division of Global Health Protection, Center for Global Health, US Centers for Disease Control and Prevention, Century Center, Building 1825, Mailstop: E-98, Atlanta, GA 30345, USA. MHusain@cdc.gov (M.J. Husain).

Conflict of interest

The authors declare there is no conflict of interest.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention, and/or Mahidol University.

Keywords

Cigarette prices; Cigarette affordability; Cigarette price-tier; Tobacco tax; Thailand; Global Adult Tobacco Surveys; Cigarette brand-switching

1. Introduction

After ratifying the WHO Framework Convention on Tobacco Control (FCTC) in 2004, Thailand introduced a wide range of tobacco control policies, including bans on smoking in indoor public places and workplaces, bans on cigarette advertising, promotion, and sponsorship, requirements for displaying health warnings on tobacco packages, and tobacco tax increases (World Health Organization, Country Office for Thailand, 2016; World Health Organization, 2013; Termsirikulchai et al., 2008). According to Thailand National Statistical Office (NSO) survey estimates, the prevalence of tobacco smoking decreased from 32.0% in 1991 to 20.7% in 2009 (Visaruthvong, 2010; Termsirikulchai et al., 2008; Tobacco Control Research and Knowledge Management Center, 2009). In May 2009, Thailand implemented a cigarette tax increase, which raised the excise tax rate from 80% to 85% of the ex-factory price (Vathesatogkit and Charoenca, 2011; World Health Organization, 2011). The expectation among policymakers was that the 2009 tax increase would be followed by additional declines in smoking rates. However, comparison of Thailand smoking patterns before and after the tax increase, obtained from the 2009 and 2011 Global Adult Tobacco Survey (GATS), revealed that overall tobacco use remained unchanged and that quit attempts declined among current smokers (Bureau of Tobacco Control, 2012; GATS, 2012).

While raising the price of tobacco products by increasing the tobacco taxes has been shown to be effective in reducing tobacco use, evidence suggests that rising cigarette prices can be accompanied by compensatory behavior in the form of increased price minimization by smokers (International Agency for Research on Cancer, 2011; World Health Organization, 2015; Ross et al., 2009; Cornelius et al., 2014; Bader et al., 2011; Xu et al., 2013; Licht et al., 2011; Kengganpanich et al., 2009). Price minimization strategies, such as switching to less expensive brands, buying products in bulk, or purchasing individual cigarettes, aim to alleviate the rise in smoking costs at the individual level, and can attenuate the effect of increased taxes on smoking at the population level. In Thailand, a 2005 tobacco excise tax increase was significantly associated with price-compensating strategies like substituting roll-your-own cigarettes for manufactured cigarettes and switching to less expensive brands (White and Ross, 2015). Following the 2009 increase in the excise tobacco tax in Thailand, a number of new inexpensive cigarette brands were introduced by the Thailand Tobacco Monopoly (TTM) (Bureau of Tobacco Control, 2012; GATS, 2012). According to Bureau of Tobacco Control, of the top five cigarette brands, two were inexpensive brands (approximately 30–45 Thai Baht (THB)/pack) of Thailand Tobacco Monopoly (TTM), accounting for about one-third of purchased brands (Bureau of Tobacco Control, 2012). This restructuring of the cigarette market may be related to the absence of a decline in cigarette smoking rates in Thailand between 2009 and 2011 by increasing opportunities for brand down-switching by smokers.

The goal of this paper is to investigate changes in the average price paid per pack, the affordability of cigarettes, and brand price-tier choice after the 2009 tobacco tax increase in Thailand. We use data from Thailand Global Adult Tobacco Survey (GATS) to discuss patterns of smoking prevalence across regions in relation to changes in price, affordability, and brand price-tier choice. To our knowledge, this is the first paper examining smokers' response to 2009 cigarette tax increase in Thailand by exploring changes in cigarette price, affordability, and cigarette consumption across regions and price-tiers, and providing a better picture of what was actually going on in the market. The study demonstrates how consumers responded to the tax increase in 2009 and provides evidence of compensatory behavior.

2. Data and methods

2.1. Data

We used data from GATS Thailand 2009 and 2011. GATS is a component of the Global Tobacco Surveillance Systems (GTSS) developed by the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC) to track tobacco use among persons aged 15 and older across countries (Palipudi et al., 2013). GATS employs standardized survey methodology and generates nationally representative estimates on individual tobacco consumption and expenditure (Palipudi et al., 2013). The field implementation for the GATS 2009 and 2011 in Thailand took place from 1 February to 31 May and 1 October to 30 December, respectively (Bureau of Tobacco Control, 2012; GATS, 2012). The 2009 and 2011 surveys had 20,566 and 20,606 interviews with overall response rates of 94.2% and 96.3%, respectively (Bureau of Tobacco Control, 2012; GATS, 2012). Both rounds included geographical identifiers for four regions (North, Northeast, South, and Central excluding Bangkok), and Bangkok.

The Central region is the most affluent region with annual per capita GDP of 204,166 Thai Baht (USD 6696) in 2011, followed by the South region with per capita GDP of 125,270 Thai Baht (USD 4108). The North-east and North regions are relatively less developed with per capita GDP of 48,549 Thai Baht (USD 1592) and 72,925 Thai Baht (USD 2392), respectively. The city of Bangkok is the most affluent area with per capita GDP of 422,141 Thai Baht (USD 13,845) (National Economic and Social Development Board, Thailand, 2014).

Smoking prevalence was defined as the percentage of adults who currently smoke tobacco (daily and less than daily) for both manufactured and roll-your-own (RYO) cigarettes. The quit attempt rate was defined as the percentage of respondents who smoked tobacco during the past 12 months and quit for 24 h or more during the past 12 months. Cigarette price paid per pack was estimated as the amount spent on 20 manufactured cigarettes at last purchase by smokers who smoke manufactured cigarettes at least once per week. Using the self-reported individual prices paid (or amount spent) per pack in the sample, we estimated two aggregate indicators of interest: cigarette affordability and cigarette price-tier. Following Blecher and van Walbeek (2008), cigarette affordability was evaluated using the relative income price (RIP), where RIP was defined as the average price paid per 100 packs of cigarettes as a percentage of GDP (Blecher and van Walbeek, 2008; Blecher, 2010). A higher RIP indicates a decline in affordability. Region-specific affordability estimates were

obtained using GDP values for each region. Average prices were consumption-weighted, and all monetary values from 2009 were inflation-adjusted for comparability to 2011 values.

Following the method described in WHO (2010), we constructed cigarette price-tiers from individual responses on brand and price paid at the time of the last cigarette purchase, as follows. The weighted-average prices paid by brand were ordered and categorized by tertiles, assigning brands into three price-tier categories: upper, middle, and lower tier. While a particular brand in a specific year can belong to only one of the three price-tiers, the same brand may or may not fall into the same tier in the next survey round, because brand prices may vary significantly from one year to another. This categorization of price-tiers allows comparing distribution of smokers buying manufactured cigarettes from the three price-tiers (low, middle, and high), but not by brands (Table 1).

2.2. Analysis

We first described unadjusted changes between 2009 and 2011 in the average price paid for manufactured cigarettes, and in cigarette affordability, by region and overall. We further evaluated unadjusted changes in consumption of brands across price-tiers by calculating the percentage of current smokers who purchased cigarettes from lower-, middle- and upper price-tiers in 2009 and 2011, by region and overall.

Next, we estimated the adjusted change in consumption across price-tiers, as well as the socio-demographic correlates of price-tier choice, using multivariate regression. The multivariate analyses were conducted only among manufactured cigarette users. Due to the ordinal nature of the dependent variable – a categorical variable denoting lower-, middle-, or upper-price-tier purchase – an ordered logit model was used to model the likelihood of purchasing from a specific price-tier. Covariates of price-tier choice included age (in 4 categories), gender, urbanicity (urban/rural), education (in 4 categories), occupation (in 6 categories), income (in 5 categories), and binary region indicators (region fixed effects). A binary indicator equal to one for year 2011 and zero for year 2009 was included to describe the adjusted average change in price-tier choice between the two periods. Thailand GATS did not collect information on brands, quantity consumed, prices paid for the roll-your-own (RYO) cigarettes, and therefore the scope of analysis is limited to manufactured cigarettes only. However, in the multivariate regression we used dual tobacco use (i.e. those smoking both manufactured and RYO cigarettes) as an additional control variable. All estimates were obtained using sampling weights for complex survey design in Stata version 14.

3. Results

Smoking rates for both manufactured and RYO cigarettes remained unchanged between 2009 and 2011 (Table 2), with overall smoking rates at 23.5% (95% CI: 22.6, 24.5) in 2009 and 23.8% (95% CI: 22.7, 25.0) in 2011 (not shown in the table). Past-year quit attempts showed a significant decline from 49.8% (95% CI: 47.0, 52.5) in 2009 to 36.7% (95% CI: 34.0, 39.4) in 2011, constituting 26.3% relative decline (Table 2). All regions registered declines in the attempted quit rate.

Increases in the real price paid for manufactured cigarettes from 2009 to 2011 were observed in all Thailand regions, from an average of 48 to 52 Thai Baht (THB) – an average increase of 8.7% (Table 3). The largest increase occurred in the Central region, where the average price paid per pack rose by 11.7% between 2009 and 2011. Despite the relatively uniform growth in prices across regions, only two of the five geographical areas (the Central and South regions) experienced a significant reduction in cigarette affordability. The average national affordability of manufactured cigarettes remained unchanged.

There was a significant reduction in the consumption of cigarette brands in the top price tertile (tier), accompanied by increases in the consumption of brands in the bottom and middle price tertiles, depending on the region. In 2009, 12.4% of smokers selected brands from upper price-tier, 51.3% selected brands from middle price-tier, and 36.3% selected brands from low price-tier (Table 4). By 2011, consumption of brands from upper price-tier declined by 3.8 percentage points, a 30.6% relative reduction nationally (Table 4). The drop in consumption from upper price-tier brands varied by region: it was largest in the South region with a reduction of 86%, followed by the North region (60.6%) and Bangkok (34.3%), while the Central and Northeast regions did not experience statistically significant changes in upper price-tier consumption. Smokers of manufactured cigarettes in the Northeast region reported significant reduction in the purchase of middle-tier brands, which was accompanied by a significant increase in the purchase of low price-tier. Reductions in consumption from upper price-tier were accompanied by growth in the consumption of either middle price-tier cigarette brands (Bangkok, South region) or lower price-tier cigarette brands (North, Northeast regions).

3.1. Adjusted change in brand tier choice

The correlates of price-tier choice are listed in Table 5, where the adjusted average change in the probability of consumption by price-tiers between 2009 and 2011 is represented by the coefficient on the 2011 year indicator. The logit model coefficients for the independent variables in log-odds units are reported in the second column. Positive logit coefficients increase the chances that the smoker will be observed in a higher-priced category (i.e. upper-price-tier brands), and negative coefficients increase the chances that the smoker will be observed in a lower-priced category (i.e. middle or lower price-tier brands). We observe that choice of brands from price-tiers is affected by a number of demographic characteristics. The probability of choosing lower price-tier brands increases with age, and as expected, smokers with higher educational attainment and income show higher odds of consuming upper price-tier brands. The negative coefficient for the 2011 year dummy variable indicates increased probability of purchasing cigarettes from lower price tier-brands.

The last three columns produce the marginal effects for each category of brand choice, i.e. lower, middle, and upper price-tier brands. Adjusted estimates indicate that, on average, the proportion of smokers selecting upper- and mid-tier brands decreased while consumption of lower-tier brands increased during the study period. After controlling for a number of demographic characteristics and region effects, we estimated that between 2009 and 2011, the probability of choosing an upper price-tier brand decreased by 2.6 percentage points, the probability of choosing a middle price-tier brand decreased by 3.6 percentage points, and the

probability of choosing a lower price-tier brand increased by 6.2 percentage points (Table 5, column 3–5, marginal effects). Relative to the initial 2009 values of the consumption distribution, these point-changes correspond to a relative drop of 21% in upper price-tier brand consumption, 7% drop in middle price-tier brand consumption, and 17.1% increase in lower price-tier brand consumption. In the ordered logit specification, the marginal effects of the three categories sum to zero, reflecting the model's assumption that the increased probability of choosing a particular brand tier ought to be compensated by the decrease in the probability of choosing the other two tier categories.

4. Discussion

We evaluated the average change in cigarette prices, cigarette affordability, and price-tier choice among smokers in Thailand after the introduction of a 2009 tobacco tax increase. We found that although real cigarette prices increased between 2009 and 2011, the price increase did not correspond to a significant drop in cigarette affordability nationwide, as the country's domestic income increased likewise. Affordability was estimated to fall only in the two Thailand regions (Central and South). The study further provided evidence on compensatory behavior caused by the tax increase. The estimated shifts in consumption from more expensive to less expensive cigarette brands and the overall lack of change in cigarette affordability between 2009 and 2011 are both factors that may merit attention in explaining the lack of change in smoking rates after the 2009 tax increase. These patterns highlight the role of tobacco taxes in times of economic growth, when raising real prices is not guaranteed to make cigarettes less affordable.

The proportion of smokers purchasing upper price-tier cigarette brands in Thailand dropped significantly between 2009 and 2011. In all regions that experienced significant changes in consumption of brands from upper price-tier (North, South, Bangkok), the changes had a downward direction, and were accompanied by increases in either middle price-tier or lower price-tier brand consumption; although consumption from upper price-tier did not change significantly in the Northeast region, this region experienced decreases in middle price-tier consumption and increases in lower price-tier consumption. The largest unadjusted drop in consumption of top-tier cigarettes (85.9%) occurred in the region with the highest reduction in affordability (South), which is suggestive of the role that shifts in prices and affordability may play in stimulating compensatory strategies like brand down-switching. Regression models used to assess the average adjusted change in consumption of brands by price-tiers estimated significant reductions between 2009 and 2011 in upper- and middle price-tier brand consumption, and a significant increase in lower price-tier consumption. The broad shift in consumption from upper to lower price-tier brands between 2009 and 2011 provides supporting evidence of increased price-minimizing behavior in smokers following the 2009 tax increase. The relative absence of reductions in cigarette affordability, as well as an overall drop in the consumption of upper price-tier cigarette brands, can be contributing factors for the estimated lack of change in smoking rates despite the growth in real cigarette prices after the 2009 tax increase in Thailand. These findings are consistent with an analysis of a previous 2005 tax increase in Thailand 2005, which was found to promote down-trading from more to less expensive cigarette brands (White and Ross, 2015). We estimated a larger down-trading impact attributable to 2009 tax increase compared to the estimates by White

and Ross (2015), where between 2005 and 2006, 8.3% of cigarette users switched to a cheaper brand and 3.5% switched to a more expensive brand.

The reasons that we observed a large proportion of consumers switching from more to less expensive cigarette brands may be attributable to: (1) the tax increase makes smoking more expensive than before, and (2) the increase in the availability of inexpensive cigarette brands after the tax increase, making it easier for consumers to do so. The availability of inexpensive cigarette brands increased after the 2009 tax increase with the launching of new inexpensive cigarette brands by the Thailand Tobacco Monopoly (TTM) (Bureau of Tobacco Control, 2012; GATS, 2012). Cross-border legal and illicit cigarette trade can also be a determinant of the availability of affordable cigarette brands (Ketchoo et al., 2011). Thailand shares borders with five countries and two oceans/seas: Laos and Cambodia to the east, the Gulf of Thailand, Malaysia, and Indonesia to the south, and the Andaman Sea and Myanmar to the west. Thailand's maritime boundaries include Vietnam in the Gulf of Thailand to the southeast, and Indonesia and India on the Andaman Sea to the southwest (Wikipedia (a) (n.d.); Wikipedia (b) (n.d.)). Further research investigating the implication of such geo-political positioning of Thailand on within-country regional heterogeneities in tobacco use will contribute to informing region-specific tobacco control strategies.

Also, tobacco tax structure within a country can impact the variability of prices, influencing consumption and tobacco users' incentives to switch down to cheaper alternatives in response to tax and price increases (Chaloupka et al., 2014). The ad valorem cigarette tax structure in Thailand may have created incentives for manufacturers to produce low quality, low price cigarettes, leading to a greater price gap among brands. These unintended consequences reduces the effectiveness of taxation in reducing cigarette use by increasing opportunities for substitution to cheaper brands (Shang et al., 2013; Chaloupka et al., 2014). The policy implication for Thailand is to adopt the uniform specific tax structure, which simplifies the taxation system and has advantages in raising the average prices and the relative price of lower-priced to higher-priced cigarettes, thereby increasing the effectiveness of tax increases in reducing smoking (Shang et al., 2013; Chaloupka et al., 2014).

Acknowledgments

Funding

N/A.

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Table 1

Average price of manufactured cigarettes, by price tier.

Price tiers	Weighted average price (95% CI), in THB	
	GATS 2009 (inflation-adjusted)	GATS 2011
1 (lower)	43.82 (42.66–44.98)	42.63 (41.76–43.50)
2 (middle)	53.05 (52.45–53.65)	61.72 (61.17–62.26)
3 (upper)	55.79 (54.13–57.44)	66.62 (65.01–68.23)

Note: Price tiers based on tertiles of weighted-average prices by brand.

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Table 2

Prevalence of tobacco use and quit attempts, GATS Thailand, 2009 and 2011.

	Current manufactured cigarette smokers			Current hand-rolled (RYO) cigarette smokers			Dual smokers of manufactured and hand-rolled cigarette			Quit attempt during the last 12 months (%)		
	2009	2011	Relative change (%)	2009	2011	Relative change (%)	2009	2011	Relative change (%)	2009	2011	Relative change (%)
Overall	15.0 (14.2, 15.8)	15.2 (14.3, 16.2)	1.7	14.1 (13.2, 15.0)	14.4 (13.3, 15.6)	2.2	5.5 (4.9, 6.2)	5.8 (5.0, 6.6)	4.9	49.8 (47.0, 52.5)	36.7 (34.0, 39.4)	-26.3*
Bangkok	17.5 (16.2, 18.9)	16.6 (15.1, 18.3)	-4.9	2.6 (2.1, 3.2)	3.3 (2.5, 4.2)	25.6	1.1 (0.8, 1.5)	1.8 (1.3, 2.6)	67.6	45.6 (41.4, 50.0)	41.2 (36.4, 46.2)	-9.8*
Central	15.8 (14.5, 17.2)	16.7 (15.0, 18.5)	5.2	10.8 (9.2, 12.7)	10.8 (9.1, 12.8)	0.1	3.4 (2.6, 4.5)	4.1 (3.1, 5.4)	19.5	55.5 (50.6, 60.2)	42.1 (37.5, 46.9)	-24.0*
North	10.9 (9.5, 12.6)	11.3 (9.6, 13.3)	3.5	12.9 (11.0, 15.0)	13.5 (11.5, 15.8)	4.8	2.3 (1.6, 3.1)	3.9 (2.8, 5.4)	70.9	46.8 (40.6, 53.0)	28.2 (22.6, 34.7)	-39.6*
Northeast	14.2 (12.6, 15.9)	14.0 (12.0, 16.2)	-1.6	17.2 (15.2, 19.3)	17.7 (15.1, 20.5)	2.8	7.5 (6.1, 9.2)	6.6 (4.9, 8.7)	-12.5	51.6 (45.7, 57.6)	39.7 (33.8, 45.9)	-23.1*
South	19.0 (16.9, 21.2)	20.0 (17.9, 22.3)	5.3	23.0 (20.9, 25.2)	22.3 (19.9, 25.0)	-2.8	12.3 (10.5, 14.2)	12.4 (10.5, 14.6)	1.2	43.0 (38.9, 47.3)	28.9 (24.9, 33.2)	-32.9*

Note: Authors' own calculation using Thailand GATS 2009 and 2011. 95% confidence intervals (CI) in parentheses.

Significant ($p < 0.05$) relative changes are indicated with asterisk (*) based on the respective z-statistics.

Table 3

Price paid per pack and affordability index (relative income price) of manufactured cigarettes, GATS Thailand, 2009 and 2011.

	Price paid per pack (THB)		Affordability index (relative income price)		Annual GDP per capita (THB)		
	2009 (inflation adjusted)	2011	Relative change (%)	2009	2011	2009	2011
Overall	47.8 (47.1, 48.5)	52.0 (51.0, 52.9)	8.7*	5.2 (4.9, 5.5)	5.6 (5.3, 5.9)	143,353	164,513
Bangkok	51.0 (50.1, 51.9)	53.3 (51.8, 54.7)	4.4*	1.3 (1.2, 1.3)	1.3 (1.2, 1.3)	377,183	422,141
Central	46.5 (45.0, 48.1)	51.9 (50.0, 53.8)	11.7*	2.2 (2.1, 2.2)	2.5 (2.5, 2.6)	200,292	204,166
North	45.5 (43.8, 47.2)	49.1 (47.2, 51.1)	8.0*	6.8 (6.5, 7.1)	6.7 (6.5, 7.0)	62,372	72,925
Northeast	47.2 (45.5, 48.8)	51.2 (48.9, 53.4)	8.4*	10.7 (10.3, 11.0)	10.5 (10.1, 11.0)	41,237	48,549
South	49.8 (48.5, 51.2)	54.4 (52.3, 56.4)	9.1*	3.7 (3.6, 3.8)	5.8 (5.6, 6.0)	93,400	125,270

Note: Authors' calculation using Thailand GATS 2009 and 2011. 95% confidence intervals in parentheses.

Significant ($p < 0.05$) relative changes are indicated with asterisk (*) based on the respective z-statistics. Regional GDP per capita values obtained from the National Economic and Social Development Board, Thailand, 2014. Gross Regional and Provincial Product, Chain Volume Measure 2012. http://eng.nesdb.go.th/Portals/0/eco_data/account/gpp/2012/Summary2012.pdf.

Official exchange rates (THB per US\$, period average) for 2009 and 2011 were 34.29 and 30.49, respectively (Source: World Development Indicators, <http://data.worldbank.org/indicator/PA.NUS.FCRF>, last updated April 17, 2017).

Table 4

Percentage of current manufactured cigarette smokers who buy brands from upper, middle, and lower price-tiers, 2009 and 2011.

	Upper-tier brands			Middle-tier brands			Lower-tier brands			Relative change (%)
	2009	2011	Relative change (%)	2009	2011	Relative change (%)	2009	2011	Relative change (%)	
Overall	12.4 (10.7, 14.3)	8.6 (6.9, 10.6)	-30.6 (<i>p</i> = 0.001)	51.3 (48.1, 54.5)	51.4 (48.1, 54.8)	0.2 (<i>p</i> = 0.960)	36.3 (33.2, 39.5)	40.0 (36.7, 43.4)	10.1 (<i>p</i> = 0.134)	
Bangkok	24.7 (20.7, 29.2)	16.2 (13.0, 20.0)	-34.3 (<i>p</i> = 0.000)	40.7 (36.6, 45.0)	57.3 (52.5, 62.0)	40.7 (<i>p</i> = 0.000)	34.6 (30.4, 38.9)	26.5 (22.5, 30.8)	-23.5 (<i>p</i> = 0.002)	
Central	11.5 (7.8, 16.6)	10.7 (7.9, 14.4)	-6.5 (<i>p</i> = 0.780)	50.3 (44.8, 55.8)	53.6 (47.5, 59.5)	6.5 (<i>p</i> = 0.448)	38.2 (33.4, 43.4)	35.7 (30.3, 41.5)	-6.5 (<i>p</i> = 0.501)	
North	11.5 (7.3, 17.6)	4.5 (2.5, 7.9)	-60.6 (<i>p</i> = 0.000)	43.9 (35.8, 52.5)	38.8 (31.0, 47.3)	-11.7 (<i>p</i> = 0.364)	44.6 (36.4, 53.1)	56.7 (48.3, 64.7)	27.1 (<i>p</i> = 0.081)	
Northeast	3.6 (2.2, 5.9)	8.9 (5.0, 15.1)	143.5 (<i>p</i> = 0.117)	57.0 (49.2, 64.6)	39.3 (32.5, 46.5)	-31.2 (<i>p</i> = 0.000)	39.3 (31.9, 47.3)	51.9 (44.2, 59.5)	31.9 (<i>p</i> = 0.054)	
South	21.1 (16.6, 26.5)	3.0 (1.9, 4.5)	-85.9 (<i>p</i> = 0.000)	56.7 (51.1, 62.1)	75.2 (69.3, 80.2)	32.7 (<i>p</i> = 0.000)	22.2 (17.8, 27.3)	21.8 (16.9, 27.7)	-1.6 (<i>p</i> = 0.922)	

Notes: 95% confidence intervals in parentheses; *p* values for relative changes are based on the respective z-statistics.

Table 5

Correlates of price-tier choice: ordered logit model coefficients and marginal effects.

	Dependent variable: brand tier choice			
	Coefficients	Marginal effects		
		Upper price-tier brands	Middle price-tier brands	Low price-tier brands
Year 2011	-0.285* (-0.467, -0.103)	-0.026* (-0.042, -0.009)	-0.036* (-0.059, -0.013)	0.062* (0.023, 0.101)
Age				
15– 24 years	Reference category			
25– 44 years	-0.507* (-0.729, -0.284)	-0.053* (-0.079, -0.027)	-0.052* (-0.071, -0.032)	0.105* (0.061, 0.149)
45– 64 years	-0.890* (-1.162, -0.617)	-0.082* (-0.110, -0.055)	-0.110* (-0.142, -0.077)	0.192* (0.135, 0.248)
65 or older	-0.986* (-1.463, -0.508)	-0.088* (-0.125, -0.051)	-0.126* (-0.199, -0.052)	0.214* (0.108, 0.320)
Gender				
Female	Reference category			
Male	-0.298 (-0.709, 0.112)	-0.030 (-0.075, 0.015)	-0.033 (-0.071, 0.005)	0.063 (-0.020, 0.145)
Residence				
Urban	Reference category			
Rural	-0.161 (-0.345, -0.023)	-0.015 (-0.031, 0.002)	-0.020 (-0.044, 0.004)	0.035 (-0.005, 0.075)
Education				
No formal education/less than primary	Reference category			
Completed primary/less than secondary	0.076 (-0.171, 0.323)	0.006 (-0.013, 0.025)	0.011 (-0.025, 0.048)	-0.017 (-0.073, 0.039)
Completed secondary/high school	0.186 (-0.041, 0.413)	0.015 (-0.003, 0.033)	0.026 (-0.007, 0.060)	-0.042 (-0.093, 0.010)
Completed college/university or above	0.970* (0.612, 1.328)	0.107* (0.061, 0.153)	0.088* (0.057, 0.119)	-0.195* (-0.262, -0.128)
Occupation				
Government employee	Reference category			
Non-govt. employee	-0.150 (-0.456, 0.156)	-0.012 (-0.039, 0.014)	-0.021 (-0.061, 0.020)	0.033 (-0.034, 0.100)
Self-employed	0.110 (-0.189, 0.408)	0.010 (-0.017, 0.037)	0.014 (-0.025, 0.052)	-0.024 (-0.089, 0.041)
Student	0.369 (-0.387, 1.126)	0.037 (-0.047, 0.121)	0.040 (-0.030, 0.110)	-0.077 (-0.229, 0.075)
Homemaker	0.172 (-0.577, 0.920)	0.016 (-0.057, 0.089)	0.021 (-0.064, 0.106)	-0.037 (-0.195, 0.121)
Unemployed and retired	0.343 (-0.191, 0.878)	0.034 (-0.023, 0.091)	0.038 (-0.016, 0.092)	-0.072 (-0.182, 0.037)
Income quintiles				
Lowest	Reference category			
Low	0.002 (-0.366, 0.371)	0.000 (-0.028, 0.028)	0.000 (-0.055, 0.056)	0.000 (-0.084, 0.083)
Middle	0.190 (-0.158, 0.538)	0.015 (-0.012, 0.043)	0.027 (-0.024, 0.078)	-0.043 (-0.120, 0.035)
High	0.245 (-0.082, 0.572)	0.020 (-0.005, 0.046)	0.034 (-0.014, 0.082)	-0.054 (-0.128, 0.019)
Highest	0.518* (0.174, 0.862)	0.048* (0.018, 0.077)	0.064* (0.017, 0.112)	-0.112* (-0.188, -0.037)
Regions				
Bangkok	Reference category			
Central region	-0.363* (-0.591, -0.134)	-0.039* (-0.064, -0.014)	-0.036* (-0.059, -0.013)	0.075* (0.028, 0.121)

Dependent variable: brand tier choice				
	Coefficients	Marginal effects		
		Upper price-tier brands	Middle price-tier brands	Low price-tier brands
North region	-0.887* (-1.180, -0.594)	-0.079* (-0.105, -0.053)	-0.116* (-0.159, -0.073)	0.195* (0.131, 0.259)
Northeast region	-0.797* (-1.054, -0.540)	-0.073* (-0.098, -0.049)	-0.101* (-0.137, -0.065)	0.174* (0.118, 0.229)
South region	0.049* (-0.193, 0.292)	0.006 (-0.024, 0.036)	0.003 (-0.014, 0.020)	-0.009 (-0.056, 0.037)
Dual smoker	0.105 (-0.107, 0.317)	0.009 (-0.009, 0.028)	0.013 (-0.014, 0.040)	-0.023(-0.069, 0.023)

Note: The 95% confidence interval values for the respective coefficients are in the parentheses.

* indicates coefficient significant at 1% ($p < 0.01$).

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