

The effect of cigarette prices on brand-switching in China: a longitudinal analysis of data from the ITC China Survey

Justin S White,¹ Jing Li,¹ Teh-wei Hu,¹ Geoffrey T Fong,^{2,3} Yuan Jiang⁴

¹School of Public Health, University of California at Berkeley, Berkeley, California, USA

²Department of Psychology, University of Waterloo, Waterloo, Ontario, Canada

³Ontario Institute of Cancer Research, Toronto, Ontario, Canada

⁴Office of Tobacco Control, Chinese Centre for Disease Control and Prevention, Beijing, China

Correspondence to

Dr Justin S White, School of Public Health, University of California, Berkeley, 247C University Hall, Berkeley, CA 94720, USA; jswhite@berkeley.edu

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ABSTRACT

Background Recent studies have found that Chinese smokers are relatively unresponsive to cigarette prices. As the Chinese government contemplates higher tobacco taxes, it is important to understand the reasons for this low response. One possible explanation is that smokers buffer themselves from rising cigarette prices by switching to cheaper cigarette brands.

Objective This study examines how cigarette prices influence consumers' choices of cigarette brands in China.

Methods This study uses panel data from the first three waves of the International Tobacco Control China Survey, drawn from six large cities in China and collected between 2006 and 2009. The study sample includes 3477 smokers who are present in at least two waves (8552 person-years). Cigarette brands are sorted by price into four tiers, using excise tax categories to determine the cut-off for each tier. The analysis relies on a conditional logit model to identify the relationship between price and brand choice.

Findings Overall, 38% of smokers switched price tiers from one wave to the next. A ¥1 change in the price of cigarettes alters the tier choice of 4–7% of smokers. Restricting the sample to those who chose each given tier at baseline, a ¥1 increase in price in a given tier would decrease the share choosing that tier by 4% for Tier 1 and 1–2% for Tiers 2 and 3.

Conclusions China's large price spread across cigarette brands appears to alter the brand selection of some consumers, especially smokers of cheaper brands. Tobacco pricing and tax policy can influence consumers' incentives to switch brands. In particular, whereas ad valorem taxes in a tiered pricing system like China's encourage trading down, specific excise taxes discourage the practice.

INTRODUCTION

Cigarettes are relatively affordable in China, and their affordability has increased with rising incomes over the last two decades.¹ Retail data from 2009 (described below) indicate that cigarettes are available in some urban areas for less than ¥2 per pack (approximately US\$ 0.30). Such low-price cigarettes have been identified as a central impediment to smoking cessation.^{2,3} A second feature of the cigarette market in China is the considerable variability of prices across brands. The range in prices per pack in Chinese stores routinely vary 10-fold and in some stores 50-fold or more. This wide price spread across brands makes it easy for smokers to switch to cheaper cigarettes in China,

relative to other countries where the variability of prices is lower.

In the present study, we sought to understand the extent to which cigarette prices alter the purchasing decisions of smokers in China. The answer has profound health and policy implications for China's 300 million smokers.

Research over several decades has established that smokers are sensitive to changes in cigarette prices (eg, Chaloupka and Warner).⁴ The consensus estimate is that, on average—albeit with variation across studies, contexts, empirical specifications and estimation approaches typically falling between −0.2 and −0.6—a 10% price increase is associated with a 4% decline in cigarette consumption, implying a price elasticity of −0.4.^{5,6} (See the 2011 International Agency for Research on Cancer report and references therein for more discussion.⁵) Yet in China, the price elasticity of demand has been considerably lower, based on analyses of high-quality, individual-level data, although some older studies and time series analyses have found tobacco use in China to be more price-elastic.⁷ Lance *et al.*⁸ find a best estimate of −0.007 in nine Chinese provinces from 1993 to 1997. In an updated analysis, White and Hu⁹ find similar price insensitivity over the subsequent decade. Mao *et al.*¹⁰ use national data to estimate a price elasticity estimate of −0.15.¹⁰ Huang *et al.*¹¹ estimate a price elasticity of consumption (ie, excluding quit behaviour) of −0.13 between 2006 and 2009, using International Tobacco Control (ITC) Survey data. The overall lack of price sensitivity in China raises the public health concern that tobacco tax policy will have little impact on smoking behaviour.

Three potentially overlapping explanations may account for the low observed price elasticity in China. First, prices have changed little over time, and researchers lack sufficient price variation to identify the effect of prices on cigarette demand. Second, rising incomes have outpaced changes in cigarette prices, making cigarettes increasingly affordable over time and making it appear as though smokers do not respond to price changes. Third, the large spread in prices across cigarette brands enables Chinese smokers to buffer themselves against rising cigarette prices by switching to cheaper cigarette brands. Li *et al.* (2011) provide some empirical support for this latter hypothesis by showing that Chinese smokers who buy less-expensive brands tend to be less likely to intend to quit.² In addition, some studies have documented in other contexts an association between cigarette price and type of cigarette

smoked.^{12–17} Our study provides the first direct test of how price affects smokers' choice of cigarette brands in China. We do so in an empirical framework that also addresses the price variation hypothesis and controls for longitudinal changes in income. Our results highlight how pricing and tax policy in China alter consumers' incentives for choosing one brand over another.

METHODS

Data

Our data come from the ITC China Survey, a longitudinal survey of smoking behaviour among adults in China. We use the first three panels of the survey data, collected in 2006, 2007–2008 and 2009 in six capital cities: Beijing, Shanghai, Guangzhou, Shenyang, Changsha and Yinchuan. The ITC China Survey employs a multistage cluster sampling method to obtain a representative sample of adult smokers and non-smokers at the city level. In addition, individual-level sampling weights were constructed to estimate population characteristics. A more detailed description of the methodology of the ITC China Survey is presented in Wu *et al.*¹⁸

For the purpose of tracking the same individuals' brand choices at multiple points in time, we restricted the sample to the 4632 continuing smokers who participated in the ITC China Survey for at least two waves. After dropping those smokers for whom the tier choice could not reliably be determined, as discussed below, the final analytical sample included 3477 persons who constituted 8552 person-years (ie, 8552 total observations in the analysis, roughly 2.5 per person). Overall retention in our selected sample is 82.0% which is relatively high.

Variables

Dependent variable

The dependent variable was a smoker's choice of cigarette price tier in each wave. Since this information was not readily available in the survey data, we constructed the dependent variable using the brand and price information of cigarettes last purchased by each smoker at the time of survey. Smokers were asked in each wave to provide the brand family, brand variety, total spending and quantity purchased when they last bought cigarettes for themselves, from which we determined the brand and per-pack price of cigarettes. The quantity last purchased is either the number of packs or the number of cartons (equal to 20 packs). Our analysis converts all prices into a per-pack equivalent.

We first validated the price data from the survey against cigarette retail price data collected in the six ITC cities at the same time that Wave 3 was fielded. The retail prices were very similar to average brand-specific prices in the Wave 3 survey data. We compared the city-level median price of the eight most commonly selected brand varieties in the survey data to those varieties' reported retail prices by city, and they were identical for five varieties and differed by less than ¥0.5 for the other three varieties. Next, we assigned to each observation a brand variety code using the ITC Project's classification scheme, based on the Universal Product Code on the barcode of each pack. For cases in which the interviewer entered a name in the 'Other' variety field, we manually assigned a brand variety code based on the names provided by respondents. Through these two routes, we were able to assign a brand variety code to 78% of all observations involving continuing smokers, which constitutes our final sample. We calculated the median price for each brand variety in each city as the basis for assigning price tiers.

In order to sort brand varieties into price tiers, it is important to use a meaningful, exogenous source of information to determine the cut-off for each tier. We used the six-grade classification of cigarette allocation prices to calculate the retail price range for each grade, which is presented in table 1. In China, allocation prices are similar to producer prices and serve as the basis for cigarette excise taxes. The allocation prices are drawn from China's State Tobacco Monopoly Administration, as reported in Gao, Zheng and Hu (2012).¹⁹ We combined the three most expensive grades into one tier in our analysis because each of those tiers had very few observations. Hence our final classification of cigarette price has four tiers. We assigned a price tier to each observation based on the range into which its by-city median brand variety price falls.

Independent variables

The independent variable of interest is the nominal price of all tiers from which each smoker chooses. Our analyses depend on relative tier prices; thus, using real prices would have no impact on the analyses. For each tier, we use the median price of all corresponding brand varieties in each city at each wave. Our price measure thus represents the tier-specific market price smokers face in a given city and at a given wave. This measure should be insensitive to any non-systematic bias in smokers' self-reported price.

In addition, we control for a variety of demographic characteristics of smokers: gender, age, income at each wave, education at baseline and average number of cigarettes smoked per day at baseline. Gender, income and education information are coded as categorical variables and enter our model as dummy variables, whereas age and baseline quantity smoked are continuous variables. We also include tier-specific constants and control for the city and wave of each observation. As such, only those factors that vary temporally and geographically may bias our results. We have no evidence that omitted variables such as brand-specific advertising and marketing vary systematically by wave and by city.

Statistical model

We employ a conditional logit framework,²⁰ which models the probability of a smoker choosing a given tier of cigarettes as a logit function of a linear combination of all independent

Table 1 Cigarette retail prices in China by tier, 2009

Tier	Retail price (¥/pack)	Producer profit (%)	Retail profit (%)	Smokers (N)	Smokers (%)
1	[0, 2.65)	17.6	10.0	1114	13.2
2	[2.65, 5.15)	25.0	10.0	3830	45.3
3	[5.15, 8.97)	33.3	10.0	2345	27.7
4	[8.97, 18.95)	33.3	15.0	955	11.3
5	[18.95, 29.76)	40.8	15.0	150	1.8
6	[29.76, ∞)	51.5	15.0	59	0.7
				8453	100.0

Retail price ranges are calculated according to the formula (Gao, Zheng and Hu, 2011): Retail Price=Allocation Price \times (1+Producer π) \times (1+Retail π) \times (1+VAT), where π denotes profit and VAT is the value-added tax. The ranges for profits come from Gao, Zheng and Hu (2012). For retail price ranges, a bracket denotes a closed interval, and a parenthesis denotes an open interval. Tiers 4–6 are combined for analysis due to small cell sizes. Cell counts and proportions are survey weighted. The unweighted sample size is 8552 person-years from 3477 smokers.

variables:

$$\Pr(Y_{it} = k) = \frac{\exp(V_{ikt})}{\sum_{j=1}^4 \exp(V_{ijt})}, \quad k = 1, 2, 3, 4 \quad (1)$$

where

$$V_{ijt} = \alpha P_{ijt} + X_{ijt}\beta_j \quad (2)$$

In a given wave t , each smoker i chooses a price tier k from a menu of j tiers. Smoker i 's cigarette tier choice is a logit function of the tier-specific price P_{ijt} and a vector of control variables X_{ijt} , described above. The coefficient of interest is α on tier price.

The conditional logit model differs from a standard logit model in that it allows for inclusion of alternative-specific variables, in this case cigarette prices that vary by tier. The regression includes four different price measures for each smoker, one for each tier, allowing us to take into account the full set of prices each smoker faced in his or her city at a given point in time. In addition to the regression coefficients, the analyses also allows us to estimate the average marginal effects of cigarette tier prices, that is, the change of probability in choosing a given cigarette tier resulting from a ¥1 increase in the median price of that tier. We computed the net marginal effects, accounting for movement in and out of a given tier, and the gross marginal effects, accounting only for movement out of a given tier. The net effects were calculated from the full sample, whereas the gross effects were calculated separately for each tier by restricting the sample to those smokers who used a given tier at baseline (ie, in the earliest wave in which the smoker appeared in the sample). We computed bootstrapped standard errors for the average marginal effects, using 1000 repetitions and clustering at the individual level.

RESULTS

Descriptive statistics

Table 1 shows the retail price ranges associated with each cigarette tier. About 45% of smokers chose a brand that falls in the second-cheapest tier (roughly ¥3–¥5 per pack). The next most commonly selected is the third-cheapest tier (28%, ¥5–¥9), followed by the cheapest tier (13%, ¥1–¥3). Only 2.5% of smokers last bought a pack in one of the two most expensive tiers, in which cigarettes cost more than ¥19. Retail prices are derived from government-regulated profit rates for producers and retailers. Allowable profit rates vary by tier, such that more expensive packs yield greater returns.

Figure 1 shows the degree to which smokers switch cigarette tiers across waves. A majority of smokers, between 50% and 71% depending on the tier and waves under consideration, stayed within the same price tier from wave to wave, yet a sizeable fraction switch cigarette tiers over time. Overall, 38% of smokers switched tiers from one survey round to the next. For mid-priced tiers (Tiers 2 and 3), in which a smoker could choose a more or less expensive brand, trading up to a more expensive tier tended to be more common than trading down. An exception is Tier 3 users in Wave 2, who were more likely to trade down in Wave 3. The general pattern of trading up may reflect that incomes rose faster than cigarette prices during this time period, providing cigarette users with additional purchasing power. Whereas tobacco prices increased a mere 1.5% nationally from 2006 to 2009, according to the official statistics

from the tobacco consumer price index,²¹ average nominal incomes for urban residents rose 46% during this time period.²³

According to the descriptive statistics presented in table 2, more than 96% of the sample is men. The average age of smokers is 51 years. The average price of cigarettes purchased is ¥6.32 and the median price (not shown) is ¥5.00. Average nominal and real cigarette prices in 2006 terms are nearly identical, due to very low growth in the consumer price index for tobacco products during this time period. On average, sample respondents smoked 18 cigarettes, or slightly less than one full pack, per day. A plurality of smokers (46%) had a monthly household income between ¥1000 and ¥3000 (US\$150 to US \$450). About a third of the study sample had a junior high school education, about a third had a high school education, and the remainder was split between a primary or tertiary education.

MULTIVARIATE RESULTS

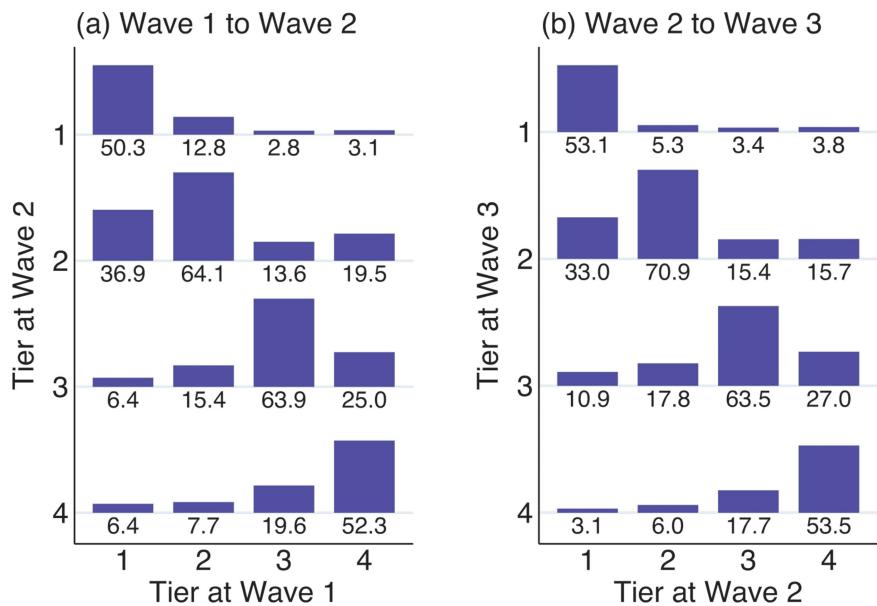
The main study results are based on a conditional logit regression of cigarette tier prices on tier choice, controlling for wave, city, sex, age, income, education and baseline cigarette intake. Table 3 shows the results of this regression. Own-tier price has a statistically significant negative effect on a smoker's choice of that tier. We consider the magnitude of the price effects in further detail below. Older smokers are significantly more likely to choose cheaper tiers. Smokers with low socioeconomic status—those with low income (below ¥1000) or low education (primary school or less)—are significantly more likely to buy from the cheapest tier, and, similarly, the probability of choosing a higher-priced tier increases with socioeconomic status. Baseline cigarette consumption is not consistently associated with tier choice, although the probability of choosing Tier 2 decreases with baseline consumption. Relative to smokers in Beijing, those in Shanghai and Guangzhou consistently have a greater likelihood of selecting a higher-priced tier (Tiers 2–4).

The magnitude of the average marginal effect of price on tier choice is described in table 4. Panel A includes the net marginal price effects of moving in and out of a given tier, and Panel B includes the gross marginal price effects of moving out of a tier for those smokers who chose that given tier in Wave 1.

We start by describing the net price effects and then describe the gross price effects. If the price of Tier-1 cigarettes rose ¥1, then the net change in the probability of choosing Tier-1 cigarettes would decrease by 0.9% points (ie, a negative own-price effect) and the net change in the probability of choosing other tiers would increase (ie, a positive cross-price effect). Similarly, the average net own-price effects for Tiers 2–4 correspond to declines in the probability of using each respective tier by 1.9% points, 1.5% points and 0.9% points. A ¥1 increase corresponds to a 20% increase in the overall median cigarette price in our sample (¥5). Whereas on net trading up to a more expensive tier is more likely than downtrading among Tier-2 smokers, the reverse is true for Tier-3 smokers. In addition, we use the share of smokers within each tier (second-to-last row in Panel A of table 4) to interpret the percentage change in the share choosing each tier as implied by that tier's net own-price effect (last row in Panel A of table 4). Dividing the net own-price effect for a given tier by the share of smokers within that tier, we calculate that ¥1 increase translates roughly into a 4–7% decrease in the net share choosing that tier, depending on the starting tier. The largest behavioural effects occur among smokers in the cheapest and the most expensive tiers.

The gross effect of tier-switching among those who used a given tier at baseline follows a similar pattern, although the

Figure 1 Percentage of smokers switching tiers between consecutive waves. Note: Column percentages are shown. (A) Displays switching from Wave 1 to Wave 2 among 2474 smokers. (B) Displays switching from Wave 2 to Wave 3 among 2240 smokers.



magnitude of the marginal effects varies somewhat between the net and gross effects. If the price of Tier-1 cigarettes rose by ¥1, then smokers of Tier-1 cigarettes would be 4.1% points less likely to choose Tier 1 in subsequent waves. The gross own-price effects for Tiers 2 and 3 are about 0.6% points and 1.7% points. In other words, Tier-1 smokers are most likely to respond to the ¥1 price change. This is consistent with the fact that ¥1 represents a larger relative price change for a pack of inexpensive cigarettes from Tier 1 than for a pack of more

expensive cigarettes from Tier 3. The added price sensitivity for Tier 1 holds when we look at how large this price effect is relative to the share of starting smokers in each tier (second-to-last row of Panel B in table 4). The ¥1 increase translates into a 4% decrease in the gross share choosing Tier 1, compared with a 1–2% decrease for Tier-2 and Tier-3 smokers. Trading up is more common for Tier-2 smokers, similar to the net effects, whereas trading up and down appears to be equally common for the Tier-3 smokers.

We ran several sensitivity analyses to validate the association between price and tier choice (results not shown). We find some evidence that the relationship is not attributable to use of smuggled cigarettes. Among the subgroup of smokers who provided to the survey enumerators a pack with an authenticity label, which we assume to be indicative of a legally purchased pack, the price coefficient is of similar magnitude (-0.087) and statistically indistinguishable from the full sample ($p=0.61$). The similarity between survey and retail price data also provides some suggestive evidence that smuggling and counterfeiting are not major concerns in our sample, because illicit tobacco use should lead the mean survey price to diverge from retail survey prices, which we do not find. The choice of sample composition—those individuals present in two or more waves—also did not affect the magnitude of the effect. Placing no restrictions on those included in the analysis ($n=10\ 020$), the price coefficient is -0.075 , insignificantly different from the restricted sample ($p=0.17$). Likewise, restricting the sample to those present in all three waves ($n=4839$) yields a price coefficient of -0.086 , also insignificantly different from our final sample ($p=0.64$),

Table 2 Descriptive statistics, 2006–2009

Variable description	Mean	SD
Binary variables		
Male	0.963	-
Monthly household income: < ¥1000	0.161	-
Monthly household income: ¥1000–2999	0.464	-
Monthly household income: ¥3000–4999	0.240	-
Monthly household income: \geq ¥5000	0.134	-
Education: Primary school or less	0.125	-
Education: Middle school	0.327	-
Education: High school	0.358	-
Education: Beyond secondary school	0.190	-
Wave 1 (2006)	0.332	-
Wave 2 (2007–08)	0.365	-
Wave 3 (2009)	0.303	-
City: Beijing	0.172	-
City: Shenyang	0.138	-
City: Shanghai	0.224	-
City: Changsha	0.185	-
City: Guangzhou	0.142	-
City: Yinchuan	0.139	-
Continuous variables		
Age at Wave 1	50.8	12.3
Cigarette tier price, nominal	6.32	6.36
Cigarette tier price, real, in 2006 terms	6.24	6.30
Average daily cigarette consumption at Wave 1	17.7	10.8

Binary variables equal 1 if the description applies and 0 otherwise. The sample includes 3477 smokers and 8552 person-years, weighted based on the complex survey design.

DISCUSSION

Nearly 40% of smokers in our sample switched tiers across survey rounds, indicating that consumers are relatively flexible in brand choices and do not display strong loyalty to one brand variety. Brand choice appears to be sensitive to the price of cigarettes, controlling for each smoker's income and several other sociodemographic characteristics. We find that a ¥1 increase in the median price of a given tier would lead 4–7% fewer smokers to select that given tier, combining the net effect of smokers moving into and out of that tier. Isolating the gross effect of a ¥1 increase in the median price of a given tier on the

Table 3 Regression results from conditional logit model

	No interaction	Interacted with Tier 2	Interacted with Tier 3	Interacted with Tier 4
Cigarette tier price	-0.095*** (0.015)			
Male		0.653*** (0.177)	0.717*** (0.264)	0.847** (0.420)
Age		-0.031*** (0.006)	-0.060*** (0.006)	-0.068*** (0.007)
Income: ¥1000–2999		0.503*** (0.114)	1.086*** (0.152)	0.931*** (0.193)
Income: ¥3000–4999		0.757*** (0.167)	1.872*** (0.203)	2.010*** (0.238)
Income: ≥ ¥5000		1.183*** (0.239)	2.483*** (0.263)	3.073*** (0.295)
Education: Middle school		0.467*** (0.168)	0.658*** (0.199)	0.430* (0.243)
Education: High school		0.545*** (0.174)	0.975*** (0.206)	0.981*** (0.237)
Education: Beyond secondary		0.879*** (0.218)	1.511*** (0.258)	1.747*** (0.282)
Cigarette consumption at Wave 1		-0.006 (0.005)	-0.143** (0.006)	-0.009 (0.007)
Wave 2		-0.165 (0.101)	-0.034 (0.113)	0.197 (0.133)
Wave 3		0.006 (0.113)	0.242* (0.134)	0.645*** (0.147)
City: Shenyang		-0.186 (0.180)	-0.081 (0.209)	1.426*** (0.303)
City: Shanghai		0.993*** (0.271)	3.462*** (0.274)	4.502*** (0.363)
City: Changsha		1.257*** (0.197)	0.336 (0.236)	2.866*** (0.311)
City: Guangzhou		0.644*** (0.208)	1.810*** (0.225)	1.454*** (0.358)
City: Yinchuan		1.244*** (0.207)	0.459* (0.249)	2.942*** (0.314)
Constant		1.235*** (0.442)	0.832 (0.539)	-0.828 (0.637)
Number of persons	3477			
Number of person-years	8552			
Number of observations	34208			

Robust standard errors, in parentheses, are clustered at the person level and weighted for survey sampling. The omitted category for categorical variables is: income below ¥1000, primary education and below, Wave 1 and Beijing. The model includes tier-specific constants.

Statistical significance: *p<0.10 **p<0.05 ***p<0.01.

probability of moving out of that tier, smokers who use cigarettes from the cheapest Tier 1 would be 4% less likely to select Tier 1 cigarettes following the price increase, whereas smokers of Tier-2 or Tier-3 cigarettes at Wave 1 would be only 1–2% less likely to select their starting tier. Thus, users of cheap cigarettes appear to be more sensitive to price increases when selecting a cigarette brand. To the extent that consumers can trade down to a cheaper brand while remaining within the same tier, our estimates may underestimate the degree to which price drives brand-switching. Overall, our findings underscore the role that tobacco pricing and tax policies can play in a consumer's brand

decision and the degree to which consumers strategically switch brands.

The Chinese government influences retail cigarette prices by regulating their four constituent parts: the tax base (the allocation price), the value-added tax, profit margins for wholesalers and profit margins for retailers.¹⁹ Current pricing regulations (of profit margins) may inadvertently promote downtrading to cheaper cigarettes among consumers. China permits more lucrative profit margins to wholesalers and retailers of higher-priced cigarettes than for lower-priced cigarettes (table 1). These incentives likely contribute to China's large price spread. More importantly, if cigarette manufacturers and retailers are able to stimulate demand for higher-priced cigarettes through advertising and special promotions, then these practices facilitate the ability of smokers to trade down to cheaper cigarettes in times of economic hardship.

China's tax policy is a direct contributor to consumers' choice of cigarette brands. In China, cigarette taxes as a percentage of retail prices have held steady at roughly 40% in recent years,²⁴ compared with the World Health Organization's recommended benchmark of 70%.²⁴ Low excise taxes on cigarettes mean that consumers feel little financial pressure to reduce tobacco expenditures by quitting smoking. Rather, smokers have the ability to purchase cheap cigarettes. The composition of cigarette taxes is perhaps more important for brand-switching than the level of taxation. In particular, ad valorem taxes (assessed as a percentage of price) and specific taxes (assessed as a fixed amount per unit) have different effects on the incentives for consumers to choose relatively less expensive brands. An increase in a uniform ad valorem tax rate would leave unchanged the relative prices across tiers while increasing the absolute price difference. Since relative prices determine resource allocation in standard microeconomic theory, a uniform increase would not alter the gains to trading down to a cheaper brand. However, in China's tiered tax system, an increase in the ad valorem tax would increase the absolute price spread and the relative prices across tiers, effectively increasing the payoff to trading down to a cheaper brand. One would expect the probability of downtrading to increase with the payoff. Moreover, China's unusually large price spread for cigarettes serves as a positive moderator of the impact of ad valorem taxes, accentuating the payoff to downtrading. In contrast, a specific tax shrinks the per cent variance across tiers, reducing the payoff to switching to a relatively cheaper brand. Specific excise taxes are superior to ad valorem taxes in reducing the absolute share of cheap cigarettes that are available in a given market, likely reducing the degree to which consumers trade down and likely increasing the extent to which a tax increase induces consumers to quit smoking. These features of specific taxes are key to why experts have advocated a reliance on specific tobacco taxation.²⁴

The current excise tax structure in China includes specific and ad valorem taxes.⁷ However, the specific tax is a mere ¥0.06 per pack. In May 2009, China's State Tobacco Monopoly Administration officially raised the ad valorem tax rates to 56% of allocation prices for packs that have an allocation price of ¥7 or more, 36% on those costing less than ¥7 and an additional 5% tax applied to the wholesale price. However, the government directed the tobacco industry to absorb the tax increase, leaving retail prices unchanged.¹¹ Thus, the tax rates felt by consumers are far less than official rates indicate. Overall, China's tax structure does little to deter downtrading and may promote it through its reliance on ad valorem taxation.

Table 4 Average marginal price effects on switching tiers

	Tier 1	Tier 2	Tier 3	Tier 4
Panel A. Net effects				
Median Tier-1 price	-0.890 (0.012)	0.640 (0.010)	0.200 (0.003)	0.070 (0.001)
Median Tier-2 price	0.622 (0.010)	-1.943 (0.009)	0.857 (0.008)	0.426 (0.006)
Median Tier-3 price	0.198 (0.003)	0.866 (0.008)	-1.515 (0.013)	0.450 (0.010)
Median Tier-4 price	0.071 (0.001)	0.437 (0.006)	0.458 (0.010)	-0.946 (0.011)
Number of person-year observations	8552	8552	8552	8552
Share of observations in Tier k	12.64%	44.68%	28.70%	13.99%
% change in share choosing Tier k, implied by net own-price effect	-7.04%	-4.35%	-5.28%	-6.76%
Panel B. Gross effects				
Median Tier-1 price	-4.050 (0.056)	0.169 (0.004)	0.154 (0.005)	-
Median Tier-2 price	2.775 (0.048)	-0.552 (0.006)	0.672 (0.016)	-
Median Tier-3 price	0.800 (0.028)	0.265 (0.004)	-1.676 (0.019)	-
Median Tier-4 price	0.474 (0.020)	0.118 (0.003)	0.850 (0.015)	-
Number of person-year observations	1236	4206	2522	-
Share of observations starting in Tier k	100.0%	100.0%	100.0%	-
% change in share choosing Tier k, implied by gross own-price effect	-4.05%	-0.55%	-1.68%	-

Average marginal price effects, reported as percentage points, are calculated from the conditional logit regression in Table 3. For each Tier k=(1, 2, 3, 4), bolded numbers denote the effect of median Tier-k price on the probability of choosing that same Tier k (ie, the own-price effect), and unbolded numbers indicate the cross-effect of median Tier-k price on the probability of choosing Tier j ≠ k (ie, the cross-price effect). Standard errors bootstrapped with 1000 repetitions are in parentheses. Net effects in Panel A, calculated on the full sample, capture the combination of movement into and out of a tier. Gross effects in Panel B, calculated for those starting in each given tier, capture movement out of a tier. The regression for the Tier-4 gross effects failed to converge due to a small sample.

Public health experts have encouraged the Chinese government to raise tobacco taxes as a way to increase cigarette prices and curb smoking rates.²⁵ Over the coming years, China is expected to follow these recommendations, in conjunction with its obligations under Article 6 of the Framework Convention on Tobacco Control, which covers price and tax measures for reducing the demand for tobacco products. Our study indicates that the design of the tax—namely ad valorem versus specific—will affect how consumers respond to the tax. The exact impact is difficult to quantify. Downtrading diminishes the price elasticity of demand to the extent that consumers' counterfactual response to the tax hike, in the absence of an ability to trade down, would be to quit smoking. In order to estimate the effect of a tax on consumer behaviour with and without downtrading, one would need to make assumptions about (1) the share of consumers who would smoke if allowed to trade down and who would quit otherwise, (2) the size and type of tax being imposed and (3) the differential impact of specific and ad valorem taxes on trading down. Our study can inform this third assumption, but we are not aware of any existing studies that address the probability of quitting under scenarios with and without downtrading. It is a topic worthy of future research.

Our study has several limitations. First, we characterised the degree of brand substitution across tiers, but we were unable to explore brand-switching within tiers. Second, we relied on self-reported prices, which could suffer from reporting bias (eg, under-reporting the price due to use of illicit cigarettes). However, the similarity between self-reported and retail prices offers some evidence that any bias is likely to be small. Finally, our analyses do not take into account heterogeneity in smokers'

preferences (eg, by education and income category), although it is an area we plan to pursue in future research.

What this paper adds

- China's government is widely expected to raise cigarette tax rates in the next decade, but how Chinese consumers will respond to a cigarette price increase is not well understood.
- This paper describes for the first time how cigarette prices have influenced the cigarette brand choice of Chinese smokers.
- The discrete choice methodology offers a rigorous approach for identifying the impact of cigarette prices on purchasing behaviour.

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Patient consent Obtained.

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国际烟草控制政策评价项目（ITC）中国研究数据的纵向分析：卷烟价格对卷烟品牌转换的影响

Justin S White,¹ Jing Li,¹ Teh-wei Hu,¹ Geoffrey T Fong,^{2,3} Yuan Jiang⁴

¹School of Public Health, University of California at Berkeley, Berkeley, California, USA
²Department of Psychology, University of Waterloo, Waterloo, Ontario, Canada
³Ontario Institute of Cancer Research, Toronto, Ontario, Canada
⁴中国, 北京市, 中国疾病预防控制中心, 控烟办公室

通讯作者：
Dr Justin S White
地址：
School of Public Health,
University of California,
Berkeley, 247C University Hall, Berkeley,
CA 94720, USA
电子邮箱：
jswhite@berkeley.edu

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摘要

背景 最近的研究发现，中国吸烟者的卷烟消费量几乎不受到卷烟价格的影响。由于中国政府考虑实行更高的烟草税，这种低响应性的原因值得探讨。一种可能的解释是，吸烟者通过选择更便宜的卷烟品牌来减轻卷烟价格提升所带来的影响。

目的 本研究探讨卷烟价格如何影响中国卷烟消费者对卷烟品牌的转换。

方法 本研究采用于2006-2009年采集的六城市ITC调查的前三轮数据。研究样本包括至少参与两轮调查的3477名吸烟者（8552人·年）的数据。卷烟品牌按价格分为四个等级，用消费税的类别来确定每一级分界点。分析采用条件logit模型，以确定价格和品牌选择之间的关系。

结果 总体来看，38%的吸烟者在三轮调查间转换了卷烟价格等级。卷烟价格每增加1元可改变4-7%吸烟者对于价格等级的选择。将研究样本限制在作为基准的价格等级时可以发现，在第1价格等级中每提高1元价格，选择该等级卷烟的人群减少4%；而在第2和第3级，每1元的价格提升导致选择的人群减少1-2%。

结论 中国卷烟品牌间较大的价格差会改变部分消费者的的品牌选择，尤其是吸廉价品牌的消费者。烟草价格和税收政策可以促使消费者转换品牌。具体来说，类似中国的分级定价从价税制鼓励向低价等级卷烟转换，而从量消费税可抑制这种行为。

前言

卷烟在中国相对便宜，而且在过去20年，随着收入增加，人们的卷烟购买力也提高了^[1]。2009年的零售数据显示（描述如下）在一些城镇地区卷烟价格每包不到2元（约0.3美元）。低价卷烟已被证实是烟草控制的核心阻力^[2,3]。中国卷烟市场的第二个特征是不同品牌间明显的价格差异。中国商店里每包卷烟的价格不同品牌间存在10倍甚至50倍以上的差异。这种价格差异使得中国吸烟者很容易转换到更便宜的卷烟品牌，相比而言，其他国家这种价格差异较小。

在本研究中，我们试图了解卷烟价格影响吸烟者购买决定的程度。该问题的答案对中国3亿吸烟者的健康以及中国的政策走向有着深远的影响。

几十年的研究发现，吸烟者对卷烟价格的变化很敏感（例如Chaloupka和Warner的研究）^[4]。尽管存在研究方法、背景、模型设定和估计方法之间的差异，文献估计的价格弹性通常在-0.2到-0.6之间，例如卷烟价格上升10%可导致消费下降4%，这意味着价格弹性为-0.4^[5,6]（更多讨论见2011年国际癌症研究机构报告及其参考文献^[5]）。但在中国，尽管之前一些研究和时间序列分析发现中国的烟草消费的价格弹性较高，基于高质量、个体水平的数据分析发现卷烟需求的价格弹性很低^[7]。Lance^[8]等人发现在1993-1997年间中国九个省的烟草价格弹性的最佳预测是-0.007。White和Hu^[9]的最新研究分析，在之后的十年中烟草价格弹性基本维持在此水平不变。Mao^[10]等人利用全国数据计算出的价格弹性在-0.15左右。Huang^[11]等人利用ITC调查的数据，得出在2006至2009年间，卷烟消费（不包括戒烟行为）的价格弹性在-0.13左右。中国公共卫生领域的一项隐忧是卷烟价格总体上缺乏弹性，烟草税政策对吸烟行为的影响甚微。

中国较低的卷烟价格弹性可以从以下三个方面解释。首先，随着时间的推移，卷烟价格变化不大，价格差异不足以使研究人员辨别卷烟价格对需求的影响。其次，收入增加超过了卷烟价格的上涨，使之对卷烟的购买力随之增加，从而显得吸烟者对价格变化不敏感。第三，不同卷烟品牌间的显著价格差异使得中国吸烟者可通过改吸廉价品牌卷烟来减缓涨价影响。Li等人（2011）通过实证研究发现买较便宜品牌卷烟的吸烟者更不愿意戒烟^[2]，该发现支持了第三种假设。另有一些研究运用其他国家的数据证明卷烟价格与吸烟类型之间的关系^[12-17]。我们的研究首次就卷烟价格如何影响中国吸烟者的卷烟品牌选择提供了直接的验证。我们的实证框架既考证了价格差异假设也控制了收入纵向变化。此次研究结果强调了中国的定价和税收政策是如何改变消费者选择特定卷烟品牌的动机的。

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方法

数据

我们的数据来自于ITC中国调查，一项研究中国成人吸烟行为的纵向研究。我们使用了前三轮的调查数据，调查时间分别为2006年、2007-2008年和2009年。该调查在中国的六个省会城市或者直辖市开展，分别为北京，上海，广州，沈阳，长沙和银川。ITC中国调查采用多阶段整群抽样的方法，获得城市级别成年吸烟者和非吸烟者的代表性样本。此外，个人水平的样本权重被用来估计总体特征。更详细的ITC研究方法介绍可参考Wu等人发表的文章^[18]。

为了追踪同一个人在多个时间点的卷烟品牌选择，我们将样本限制在至少参加了两轮ITC中国调查的4632名吸烟者。在剔除一些卷烟价格等级选择无法被可靠判定的吸烟者后（见下文讨论），最终分析样本包括3477人，8552人·年（即分析中共有8552个观测数据，每人约2.5个）。所选样本的整体保存率为82.0%，这是比较高的。

变量

因变量

因变量是在每一轮调查中吸烟者选择的卷烟价格等级。因为这个信息无法从调查数据中直接获取，我们通过使用吸烟者在接受调查时最近一次购买卷烟的品牌和价格信息来构建这一因变量。吸烟者在每一轮调查中都会被问到，最近一次为自己购买的卷烟品牌、类别、总支出和数量，利用这些信息，我们确定了卷烟品牌和每包卷烟价格。最近一次购买卷烟的数量可以是包数或条数（等于20包）。我们分析中将所有价格转换成每包价格。

通过收集第三轮调查同时期的6个城市的卷烟零售价，我们首先验证了调查中的价格数据。每个品牌的卷烟零售价与第三轮调查每个品牌的平均价格是非常相似的。我们将8个最常见的品牌品种的城市中位数价格与吸烟者报告的城市零售价进行比较，5个品牌一致，3个品牌的差价不足0.5元。接下来，根据国际产品代码即每包卷烟上的条形码，使用ITC项目的分类方案，我们为每个品牌分配了一个代码。如果调查者输入“其他”字段，我们会根据调查对象提供的卷烟名称手动分配一个代码。通过这两种方式，我们能够为78%的由连续吸烟者组成的观测数据分配代码。这构成了我们研究的最终样本。我们计算了每个品牌品种在每个城市的中位数价格，并以此来确定价格等级。

为了给品牌种类分配价格等级，运用一个有意义的、外部的信息来源来确定每个级别的分界点非常重要。我们利用六个级别的卷烟调拨价格来计算每一价格等级的零售价范围，见表1。在中国，调拨价格与生产价格相似，被用作卷烟消费税的基础值。卷烟调拨价来源于中国国家烟草专卖局，与Gao, Zheng和Hu (2012) 所报告的一致^[19]。本研究中，我们将价格最高的3个级别合并为一个，因为这几级中的观察值很少。因此，我们最终将卷烟价格确定为四个等级。卷烟品种城市中位数价格落于哪个等级，这一等级即为它的价格等级。

自变量

我们关注的自变量是每个吸烟者可选择的所有等级的名义价格。我们的分析依赖于相对等级价格。因此，使用实际或名义价格不会影响分析结果。我们用每轮调查所有城市的所有相关品牌的中位数价格来确定每一等级的价格。该价格代表

了某一城市某轮调查时，吸烟者所面临的价格等级的市场价格。该价格对吸烟者自报价格中的任何非系统性偏差应该是不敏感的。

此外，我们纳入了吸烟者的多种人口学特征：性别，年龄，每轮调查时的收入，文化程度和平均每天吸烟量。性别，收入和文化程度为分类变量，并作为0-1变量进入我们的模型，而年龄和吸烟量是连续变量。我们还纳入了分等级常量并控制了所在城市及调查时期。因此，只有那些随时间和地理上变化的因素才会影响我们的结果。没有证据表明，我们未纳入的变量，如特定品牌的广告和营销，在不同时期、不同城市间存在系统性变化。

统计模型

我们采用条件logit模型^[20]，将吸烟者选择特定价格等级的卷烟的可能性作为所有自变量线性组合的logit函数：

$$\Pr(Y_{it} = k) = \frac{\exp(V_{ikt})}{\sum_{j=1}^4 \exp(V_{ijt})}, \quad k = 1, 2, 3, 4 \quad (1)$$

其中

$$V_{ijt} = \alpha P_{ijt} + X_{ijt}\beta_j \quad (2)$$

在某一轮t，每个吸烟者i从j个等级中选择了一个价格等级k。吸烟者i的价格等级选择是特定等级价格P_{ijt}和控制变量X_{ijt}的一个logit函数，如上所述。每层价格的系数为α。

条件logit模型不同于标准logit模型，它允许纳入选择层级的变量，在这种情况下，卷烟价格根据分级而不同。回归包括每个吸烟者四种不同的价格，每级一个，使我们能够全面考虑每个吸烟者在给定时间点和城市时面临的卷烟价格。除了回归系数，此分析也允许我们估计卷烟价格的平均边际

表1 2009年中国卷烟零售价的分级列表

级	零售价 (元/包)	生产者 利润(%)	零售利 润(%)	观测数 据 (N)	吸烟者比 例 (%)
1	[0, 2.65)	17.6	10.0	1,114	13.2
2	[2.65, 5.15)	25.0	10.0	3,830	45.3
3	[5.15, 8.97)	33.3	10.0	2,345	27.7
4	[8.97, 18.95)	33.3	15.0	955	11.3
5	[18.95, 29.76)	40.8	15.0	150	1.8
6	[29.76, ∞)	51.5	15.0	59	0.7
				8,453	100.0

零售价范围根据公式 (Gao, Zheng 和 Hu , 2011) 计算得到：零售价=调配价格×(1+生产者π)×(1+零售π)×(1+VAT)，其中π代表利润，VAT代表增值税。该利润分类来自 Gao, Zheng 和 Hu 2012年的文章。对于零售价格范围，中括号是指闭区间，小括号表示开区间。4-6级合并进行分析，因为人数非常少。每格计数和比例经过加权，未加权样本量是3477个吸烟者，8552人·年。

效应，也就是中位数价格每升高1元后导致选择给定卷烟价格等级的概率变化。我们计算了选择或者停止选择给定等级的净边际效应，也计算停止选择某一等级的总边际效应。净效应是根据全样本计算的。总效应是每个等级分别计算的，仅利用基准调查（即吸烟者最早进入样本的一轮调查）时划分了价格等级的吸烟者的样本。对于平均边际效应，我们计算了自抽样的标准误差，在个体层面使用1000次重复和集群。

研究结果

描述性统计

表1显示不同卷烟级别的零售价区间。约45%的吸烟人次选择第二便宜的卷烟品牌（大约3-5元/包）。然后是第三便宜的卷烟品牌（28%，5-9元/包），其次是最便宜的（13%，1-3元/包）。只有2.5%的吸烟人次最近买了两个最高等级之一的卷烟，花费超过19元。零售价根据政府规定的生产商和零售商的利润率计算。各等级允许的利润率不同，更昂贵的烟可带来更大的利润。

图1显示了在不同时期吸烟者更换卷烟等级的程度。根据调查时间和价格等级的不同，大约50-71%吸烟者在每轮调查期间都选择同一价位的卷烟，但相当一部分人更换了卷烟品牌。总体来说，38%的吸烟者在不同时期换品牌。选择中等价位级别的（级别2和级别3）吸烟者有可能选择更贵或便宜的品牌，选择更贵的要比换成便宜的普遍。一个例外是第二轮调查中的第3等级的研究对象，在第三轮调查时更倾向选择便宜的。选择更贵的品牌可能是因为这一时期收入的增加超过卷烟价格的增长，为吸烟者提供了更多的购买力。按照烟草消费价格指数的官方统计^[21]，从2006年到2009年，烟草价格仅增长了1.5%，而城镇居民在这段时间的平均收入上涨了46%^[23]。

根据表2中的描述性统计结果，96%的研究对象为男性。吸烟者的平均年龄为51岁。购买的卷烟平均价格为6.32元、中位数价格（未显示）为5元。卷烟的平均名义价格和实际价格在2006年几乎是一样的，因为在这段时间内的烟草消费者价格指数增长很小。平均而言，受访者每天抽18支卷烟或略少于一整包。46%的吸烟者月均家庭收入在1000-3000元（150-450美元）之间。样本中大约三分之一有初中学历，约三分之一有高中学历，其余为小学或大专以上。

多元分析结果

主要研究结果基于一个对卷烟价格等级选择的条件logit回归分析，考虑了调查轮次、城市、性别、年龄、收入、文化程度和基准吸烟量。表3显示了回归分析结果。本身的价格等级对吸烟者的选 择有显著的负向影响。我们将在下文进一步详细的描述价格影响的程度。年龄大的吸烟者更倾向于选择便宜卷烟。社会经济地位较低的吸烟者（收入低于1000元）或教育程度低（小学或以下）的吸烟者，更可能买最便宜的卷烟。同样的，随着社会经济地位的提高，吸烟者更能选择价格较高的卷烟。基准卷烟消费量与等级选择不是一

致相关，尽管选择第2级的概率随着基准消费量的降低而降低。相对于在北京的吸烟者，那些在上海和广州的吸烟者更可能选择更高价位的卷烟（第2级到第4级）。

表4描述了价格的平均边际效应对卷烟等级选择的影响程度。A组包括考虑每一级的进出的净边际价格影响，而B组包括在第一轮调查中选择了既定等级后跳到另一等级的总边际价格影响。

我们先描述价格的净效应，再描述价格的总效应。如果第1级卷烟价格上涨1元，那么选择第1级卷烟的概率的净变化为-0.9%（即负的自价格效应），选择其他级卷烟的概率会增加（即正的价格效应）。同样，第2-4级的平均净价格影响分别为-1.9%，-1.5%和-0.9%。增加1元相当于整体中位数卷烟价格（5元）上涨20%。而第2价格等级的吸烟者倾向于选择更贵价位的卷烟，第3价格等级的吸烟者相反。此外，我们使用每一等级卷烟的吸烟者的比例（表4中A组第二行到最后一行）来解释选择这一等级份额的百分比变化，即暗示的净自身价格效应（表4中A组最后一行）。用该等级的吸烟者比例除以该级净价格效应，我们可以计算出，依据起始等级的不同，卷烟价格上升1元可使该等级净份额减少4-7%不等。最大的行为效应发生在最廉价和最昂贵的级别中。

对于在基准调查中使用给定等级的卷烟的吸烟者来说，各级转换的总效应遵循类似的模式，尽管边际效应幅度在净效应和总效应间有所变化。如果第1级卷烟价格上涨1元，那么在接下来的调查中，选择第1级卷烟的概率降低4.1%。自身价格的总效应在第2级和第3级分别为0.6%和1.7%。也就是说，第1级吸烟者是最有可能对1元价格变化做出反应的。这是因为1元在第1级卷烟中代表一个较大的相对价格变动，而在更贵的第3级中相对变动较小。第1级中涨价敏感性与这级基准吸烟者所占比例也有关（表4中B组第二到最后一行）。1元的价格增长，使得选择1级卷烟的总份额减少4%，第2、3级减少1-2%。第2级的吸烟者倾向于选择更高等级的卷烟。与净效应类似，第3级的吸烟者中往便宜和更贵两方向选择的机会是均等的。

我们做了若干次敏感性分析，以验证价格和等级选择之间的关联（结果未显示）。我们发现一些证据表明，这种关联并非由使用走私卷烟而导致。在一个子样本中，吸烟者提供给调查统计员一包有真实标签的卷烟，我们认定这是合法购买的，而其价格系数的数量级（-0.087）并无法从全样本中区分（P=0.61）。调查数据和零售价格数据之间的相似性也表明，走私和假货并不是我们样本中存在的主要问题。非法烟草使用会导致平均价格偏离零售价格，而我们并没有发现这一问题。样本组成（那些接受两轮或两轮以上调查的人）的选择，也丝毫不影响效应的程度。如果对所分析的样本不加限制（N=10020），价格系数为-0.075，这与受限制的样本相比（P=0.17）无显著差异。同样，如果分析的样本限制在参与全部三轮调查的吸烟者中（N=4839），得到的价格系数为-0.086，与最终分析样本的结果相比无显著差异（P=0.64）。

讨论

近40%的吸烟者在调查周期内转换卷烟等级，表明消费者对品牌选择是相对灵活的，没有表现出对一个特定品牌的忠诚。在控制每个吸烟者的收入和其他一些社会人口学特征的

图1 连续两轮调查间吸烟者转换卷烟等级的百分比。注：显示列百分比。**(A)** 显示第一轮调查到第二轮调查2474位吸烟者的转换率。

(B) 显示第二轮调查到第三轮调查的2240位吸烟者的转换率。

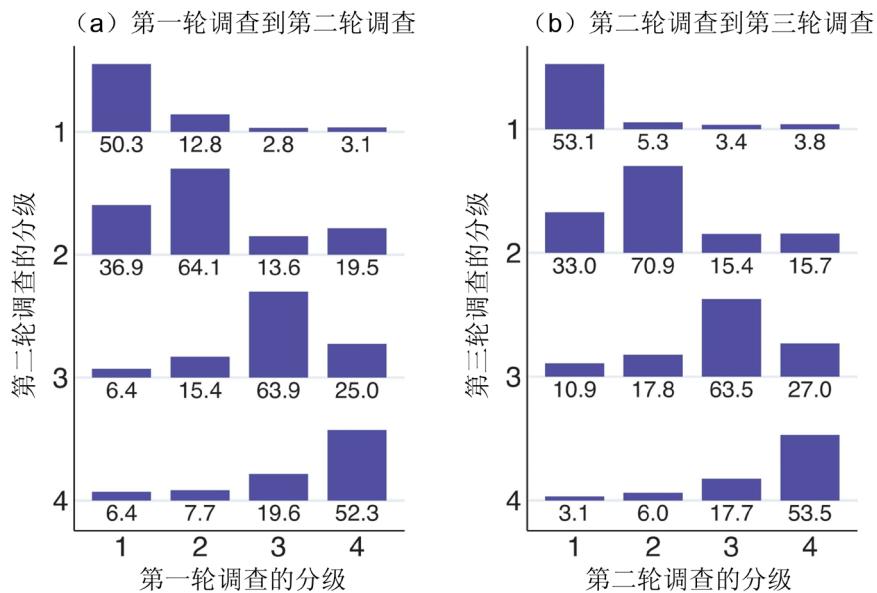


表2 描述性统计, 2006–2009

变量描述	均值	标准差
二分类变量		
男性	0.963	-
月收入: <¥1,000	0.161	-
月收入: ¥1,000-2,999	0.464	-
月收入: ¥3,000-4,999	0.240	-
月收入: ≥¥5,000	0.134	-
文化程度: 小学或更低	0.125	-
文化程度: 初中	0.327	-
文化程度: 高中	0.358	-
文化程度: 中专及以上	0.190	-
第一轮调查 (2006)	0.332	-
第二轮调查 (2007-08)	0.365	-
第三轮调查 (2009)	0.303	-
城市: 北京	0.172	-
城市: 沈阳	0.138	-
城市: 上海	0.224	-
城市: 长沙	0.185	-
城市: 广州	0.142	-
城市: 银川	0.139	-
连续变量		
第一轮调查年龄	50.8	12.3
卷烟分等级价格, 名义值	6.32	6.36
卷烟分等级价格, 实际值, 以2006年为基年	6.24	6.30
第一轮调查卷烟消费量	17.7	10.8

二分类变量情况符合为1, 不符合为0。样本包括3477人和8552人·年, 根据综合调查设计加权处理。

情况下, 品牌选择对卷烟价格敏感。我们发现, 每一级中位数价格增加1元, 将导致该级减少4-7%的吸烟者, 此数值为结合吸烟者进入或退出该等级的净效应。单独衡量指定级别中位数价格增长1元的总效应对吸烟者迁出该级的概率的影响, 第1级的吸烟者将有4%的人不再选择该级的卷烟, 第2和第3级在第一阶段调查中有1-2%可能不再选择该级别。因此, 廉价卷烟的使用者选择卷烟品牌时, 对价格上涨更为敏感。在某种程度上, 消费者可以转向同一年级但更便宜的品牌, 因此我们的估计可能低估了价格带动品牌转换的效应。总的来说, 我们的研究结果确认, 烟草价格和税收政策在消费者品牌决定和转换品牌等级上扮演重要角色。

中国政府通过调节四个组成部分来调整卷烟零售价格: 计税基数(调配价格)、增值税、批发商的利润率和零售商的利润率^[19]。目前定价法规(利润率)可能会在不经意间促进消费者选择廉价卷烟。相比低价位卷烟, 中国允许高价位卷烟的批发商和零售商享受更丰厚的利润(表1)。这些激励措施可能促使了价格差增大。更重要的是, 如果卷烟制造商和零售商能够通过广告和促销刺激高价位卷烟的需求, 那么这些做法有利于吸烟者在经济困难时期转向更便宜的卷烟。

中国的税收政策是消费者选择卷烟品牌的直接因素之一。近年来, 中国的卷烟税始终保持为零售价格的40%左右^[24], 远远低于世界卫生组织推荐70%的基准^[24]。低消费税使消费者感到较小的经济压力, 因此不会通过戒烟来减少烟草支出。更确切地说, 吸烟者有购买廉价卷烟的能力。卷烟税收组成对于品牌选择的影响比税收水平更重要。

具体而言, 从价税(按价格的百分比征税)和从量税(按每单位固定金额征税)对激励消费者选择相对便宜的品牌有不同的激励效果。一个统一的从价税率增加保持了各等级卷烟相对价格不变, 只增大了绝对的价格差。在微观经济学理论中, 相对价格决定资源配置, 统一的涨幅不会改变购

买一个更便宜的品牌所获得的收益。然而，中国的分级税制下，从价税增加将增大绝对价格差和各等级相对价格，有效地增加了购买更便宜品牌的收益，故我们预测购买更便宜品牌的概率增加。此外，中国卷烟非常大的价格差作为从价税影响的正缓和剂，增加了转换使用更便宜品牌的收益。与此相反，从量税收缩了各等级的百分差，减少了转换到一个相对便宜品牌的回报。具体来说，在减少给定市场上廉价卷烟的绝对份额这方面，从量税优于从价税，从量税有可能抑制消费者购买更便宜的卷烟的数量，提高增加税收对促进消费者戒烟的影响。从量税这些具体的功能很关键，这也是为什么专家主张实施烟草从量税^[24]。

目前中国的消费税结构包括从量税和从价税^[7]。然而从量税仅为0.06元/包。2009年5月，中国国家烟草专卖局正式将调配价格大于等于7元的从价税率提高到其价格的56%，将调配价格小于7元的从价税率升高到36%，同时在批发价基础上增加5%税收。然而，政府指导烟草行业承担税收增加带来的利润降低，使零售价格保持稳定^[11]。因此，消费者所体会到的税率实际上远低于官方规定的税率。总体而言，中国的税收结构没有阻止消费者购买更便宜卷烟，反而通过依靠从价税来促进了它的发展。

公共卫生专家都鼓励中国政府借由提高烟草税来提高卷烟价格并由此降低吸烟率^[25]。在未来几年内，中国政府被期望接受这些建议，履行《烟草控制框架公约》第6条规定的义务，它要求通过价格和税收政策降低对烟草产品的需求。我们的研究表明税收设计——即从价税与从量税——会影响消费者对税收的反应。确切的影响很难量化。向低价格等级的品牌转换降低了需求价格弹性，使得本应该戒烟的吸烟者转而消费低价卷烟。为了估计税收对转向低价或不转向低价这两种消费行为的影响，需要对如下问题做出假设：（1）如果允许转向低价品牌，消费者吸烟或戒烟的比例；（2）税收的种类和大小；（3）从量税和从价税对转向低价品牌的不同影响。我们的研究对第三类假设提供数据支持，但据我们所知，现有研究并未考察转向或不转向低价卷烟对戒烟可能的影响。这是一个值得进一步研究的课题。

我们的研究也有一些局限性。首先，我们研究了品牌转换的跨级特征，但我们无法研究在各级内的品牌转换。第二，我们依靠自报价格，可能存在报告偏误（例如，由于使用非法卷烟而报告较低的价格），但自报价格和零售价格的相似性说明偏差的程度可能较低。最后，我们的分析没有考虑到吸烟者的异质性（例如，通过教育和收入类别），这也是我们计划在未来研究中进一步探索的。

本文贡献

- ▶ 人们普遍预期中国政府将在未来10年内提高卷烟税率，但中国消费者对卷烟涨价有何反应尚不清楚。
- ▶ 本文首次研究了卷烟价格如何影响中国吸烟者选择卷烟品牌。
- ▶ 离散选择法为确定卷烟价格对购买行为的影响提供了一个严格的研究方法。

表3 条件logit 回归模型的分析结果

	无交互项	与等级2 交互	与等级3 交互	与等级4 交互
分等级卷烟价格	-0.095*** (0.015)			
男性		0.653*** (0.177)	0.717*** (0.264)	0.847** (0.420)
年龄		-0.031*** (0.006)	-0.060*** (0.006)	-0.068*** (0.007)
收入: ¥1,000 -2,999		0.503*** (0.114)	1.086*** (0.152)	0.931*** (0.193)
收入: ¥3,000 -4,999		0.757*** (0.167)	1.872*** (0.203)	2.010*** (0.238)
收入: ≥ ¥5,000		1.183*** (0.239)	2.483*** (0.263)	3.073*** (0.295)
文化程度: 初中		0.467*** (0.168)	0.658*** (0.199)	0.430* (0.243)
文化程度: 高中		0.545*** (0.174)	0.975*** (0.206)	0.981*** (0.237)
文化程度: 大专 及以上		0.879*** (0.218)	1.511*** (0.258)	1.747*** (0.282)
卷烟消费量				
第一轮调查	-0.006 (0.005)	-0.143** (0.006)	-0.009 (0.007)	
第二轮调查	-0.165 (0.101)	-0.034 (0.113)	0.197 (0.133)	
第三轮调查	0.006 (0.113)	0.242* (0.134)	0.645*** (0.147)	
城市: 沈阳	-0.186 (0.180)	-0.081 (0.209)	1.426*** (0.303)	
城市: 上海	0.993*** (0.271)	3.462*** (0.274)	4.502*** (0.363)	
城市: 长沙	1.257*** (0.197)	0.336 (0.236)	2.866*** (0.311)	
城市: 广州	0.644*** (0.208)	1.810*** (0.225)	1.454*** (0.358)	
城市: 银川	1.244*** (0.207)	0.459* (0.249)	2.942*** (0.314)	
常量	1.235*** (0.442)	0.832 (0.539)	-0.828 (0.637)	
人数	3,477			
人年	8,552			
观察例数	34,208			

括号内为稳健标准差，集聚在个人水平并经抽样加权。省略的分类变量是：收入低于1000的，小学及以下教育的，第一阶段和北京。该模型包括特定等级常量。

统计显著性： * p<0.10 **p<0.05 ***p<0.01。

表4 平均边际价格对转换等级的影响

	等级 1	等级 2	等级 3	等级 4
表格A. 净效应				
1级中位数价格	-0.890 (0.012)	0.640 (0.010)	0.200 (0.003)	0.070 (0.001)
2级中位数价格	0.622 (0.010)	-1.943 (0.009)	0.857 (0.008)	0.426 (0.006)
3级中位数价格	0.198 (0.003)	0.866 (0.008)	-1.515 (0.013)	0.450 (0.010)
4级中位数价格	0.071 (0.001)	0.437 (0.006)	0.458 (0.010)	-0.946 (0.011)
人-年的观察值	8,552	8,552	8,552	8,552
等级k的观察值比率	12.64%	44.68%	28.70%	13.99%
选择等级k的份额变化, 由净自身价格效应影响	-7.04%	-4.35%	-5.28%	-6.76%
表格B. 总效应				
1级中位数价格	-4.050 (0.056)	0.169 (0.004)	0.154 (0.005)	-
2级中位数价格	2.775 (0.048)	-0.552 (0.006)	0.672 (0.016)	-
3级中位数价格	0.800 (0.028)	0.265 (0.004)	-1.676 (0.019)	-
4级中位数价格	0.474 (0.020)	0.118 (0.003)	0.850 (0.015)	-
人-年的观察值	1,236	4,206	2,522	-
等级k的观察值比率	100.0%	100.0%	100.0%	-
选择等级k的份额变化, 由总自身价格效应影响	-4.05%	-0.55%	-1.68%	-

平均边际价格效应, 报告为百分比, 由表3的条件logit回归计算得出。对于每一等级k=(1、2、3、4), 粗体数字表示等级k的中间价对选择同一等级k的概率的影响(即自价格效应), 未加粗数字表示等级k的中间价对选择其他等级 $j \neq k$ 的概率的影响(即交叉价格效应)。括号中为经程序重复1000次计算的标准误。A组的效应, 基于全样本分析, 捕捉了转进和转出某一等级的总效应。B组的总效应, 基于在每个给定等级开始的子样本, 捕捉转出某一等级的总效应。由于样本较小, 等级4的总效应回归未能集聚。

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贡献

JSW构思和设计的研究, 分析数据, 解释结果, 并起草了初稿。JL分析数据提出结果, 并起草了初稿。TH构思和设计研究贡献了对稿件的修改。GTF监督并对稿件的早期版本的数据收集提出宝贵意见。JY监督数据收集。所有作者审阅并同意最终的文本。通讯作者拥有所有数据并为提交发表报告负全责。

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出处和同行审查 未开展; 外部同行已评审。

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