

Tax, price and cigarette brand preferences: a longitudinal study of adult smokers from the ITC Mexico Survey

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ABSTRACT

Background Recent tax increases in Mexico differed in structure and provided an opportunity to better understand tobacco industry pricing strategies, as well as smokers' responses to any resulting price changes.

Objectives To assess if taxes were passed onto consumers of different cigarette brands, the extent of brand switching and predictors of preference for cheaper national brands.

Methods Using data from three waves of the Mexican administration of the International Tobacco Control Survey, we analysed self-reported brand and price paid at last cigarette purchase. Generalised estimating equations were used to determine predictors of price and preference for national brands.

Results The average price of premium/international brands increased each year from 2008 to 2011; however, the price for discount/national brands increased only from 2010 to 2011. The percentage of smokers who smoked national brands remained stable between 2008 and 2010 but dropped in 2011. Factors related to smoking national brands as opposed to international brands included being male and having relatively older age, lower education, lower income and higher consumption.

Conclusions Tobacco industry pricing strategies in the wake of ad valorem taxes implemented in Mexico prior to 2011 had the impact of segmenting the market into discount national brands and premium international brands. The specific tax increase implemented in 2011 reduced the price gap between these two segments by raising the price of the national brands relative to the international brands. Evidence for trading up was found after the 2011 tax increase. These results provide further evidence for the relevance of tax policy as a tobacco control strategy; in particular, they illustrate the importance of how specific rather than ad valorem taxes can reduce the potential for downward brand switching in the face of decreasing cigarette affordability.

BACKGROUND

Increasing the price of cigarettes through taxation reduces prevalence, the level of consumption for those who continue smoking and smoking initiation.^{1–4} Previous research, however, also suggests that smokers may change their purchasing behaviour to minimise the effect of tax increases by switching to cheaper brands. For example, Tsai *et al*⁵ found that 17.4% of Taiwanese male smokers switched to lower-priced brands after a tax increase implemented in 2002. Also, based on information from 20 communities in the USA, Cummings *et al*⁶

found that the proportion of smokers who used discount brands increased from 6.2% in 1988 to 23.4% in 1993 as taxes and prices increased over this period. In contrast, a previous study for Mexico did not find evidence of this strategy as switching from international brands to cheaper national brands was as common as the opposite after the 2007 cigarette tax increase.⁷ Smokers may also switch to cigarettes higher in tar and nicotine as Evan and Farrelly found out using US data for 1979 and 1987.⁸

The effectiveness of tax increases can also be reduced by tobacco industry pricing strategies, such as absorbing part of these tax increases instead of passing them onto consumers. For example, one recent study shows that the tobacco industry has differently shifted taxes between price segments in the UK; while the price of high-priced brands has increased gradually, the price of low-priced brands has remained fixed between 2006 and 2009, which is associated with a large increase in the market share of the latter.⁹

Recent excise tax increases in Mexico have included taxes with and without a specific component. Each type of tax may produce a different tobacco industry pricing strategy, which in turn, can impact smokers' responses to this pricing; however, these topics have been understudied in low-income and middle-income countries. Specific taxes are monetary values per quantity (eg, pesos per cigarette), while ad valorem taxes are set as a percentage of the value of the products (eg, as a percentage of the price to the retailer or as a percentage of the price to the wholesaler). The main advantage of ad valorem taxes is that their real value is preserved as prices increase; the main disadvantages are that they require strong tax administration and are susceptible to undervaluation, which can exacerbate price differentials and brand switching. Specific taxes, on the other hand, entail low administrative requirements and are not subject to undervaluation but need to be periodically adjusted in order to keep their real value from being eroded by inflation.¹⁰

The cigarette excise tax (Special Production and Services Tax (SPST)) has been progressively increased in Mexico in recent years, from 110% of the price to the retailer in 2006 to 140% in 2007, 150% in 2008 and 160% in 2009. In addition, a specific component of MX\$0.04 (US\$0.003) per cigarette was added to the SPST in 2010, which was increased to MX\$0.35 (US\$0.03) in 2011.¹¹ The STPS (both the ad valorem and specific

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component), together with the value-added tax (VAT) of 16% of the final price, accounted for 54.2% of the price to the public in 2006, 58.9% in 2007, 60.2% in 2008, 61.4% in 2009, 62.7% in 2010 and 68.8% in 2011.¹²

Data from Mexico support evidence regarding the effectiveness of cigarette taxes in reducing consumption,^{7 12 13} while suggesting that the two tobacco companies (PMI and BAT) that control 98% of the Mexican market have segmented the market into low-cost 'discount' cigarettes, mostly comprising national brands, and significantly higher-cost 'premium' brands, mostly comprising international brands.⁷ This process of market segmentation appears to have accompanied the ad valorem taxes that were implemented in the years prior to 2010. The specific tax should narrow the gaps between prices across brand types and thereby impede further segmentation of the market.

The objectives of this study were to assess if (1) cigarette tax increases were passed onto consumers and specially to test for differential effects for national–international brands, (2) the extent of brand switching and (3) predictors of preference for national brands.

METHODS

Study sample

Data were analysed from adult smokers who participated in the last three waves (wave 3 (2008), wave 4 (2010) and wave 5 (2011)) of the Mexican administration of the International Tobacco Control (ITC) Survey. The ITC Mexico Survey is a longitudinal survey designed to evaluate the effects of tobacco control policies promoted by the WHO Framework Convention on Tobacco Control (FCTC).^{14–16} Data collected in six cities at all the three waves were analysed in this study (Guadalajara, Mérida, Mexico City, Monterrey, Puebla and Tijuana). Stratified multistage sampling was used within the urban areas of each city, wherein census tracts and then block groups were selected with probability proportional to the number of households. Households were selected at random and visited up to four times to identify eligible adult smokers (18 years or older, who smoked at least once a week and had smoked at least 100 cigarettes in their lifetime). Up to one woman and one man were interviewed per household.

Sampling weights account for the probability of household selection and are adjusted for the number of smokers within the household; thus, weighted estimates are representative of the population in the urban areas sampled. Data from the last three waves of the ITC Mexico Survey were collected between November and December 2008 (n=1760), January and February 2010 (n=1840) and March and April 2011 (n=1845). Of the 1760 participants interviewed in 2008, 74% (n=1309) were successfully followed up in 2010; of the 1840 participants interviewed in 2010, 83% were followed up in 2011 (n=1519). To maintain sample size across waves, 531 new participants were recruited in 2010 and 326 in 2011 in order to replenish the sample. Replenishment involved the same protocol in randomly selected block groups within the originally selected census tracts that had experienced the greatest loss to follow-up.

The analytic sample for this study consisted of participants in six cities who reported being current smokers at each wave (n=1644 at wave 3, n=1572 at wave 4 and n=1505 at wave 5), including those who were not followed up (n=603 from waves 3–4 and n=393 from waves 4–5) and those who were added to replenish the sample (n=857). Cases with missing values in any of the study variables were excluded from the analyses, so the person-wave observations were 4601 in total.

The ethics review board at the Mexican National Institute of Public Health approved the ITC Mexico Survey protocol, and all participants provided written informed consent before they were interviewed.

Measures

Prices per cigarette at last purchase were calculated using responses to the questions, *The last time you bought cigarettes for yourself, did you buy them by the carton, the pack or as single cigarettes*, and *How much did you pay for that (pack/single cigarette/carton)?* To adjust for different pack sizes, responses to the question *When you bought the new pack, how many cigarettes did it contain?* were used; if this information was missing or if values below 14 or above 25 were reported,¹⁷ it was assumed that packs contained 20 sticks of cigarettes (ie, the most common pack size). Price data from smokers who reported buying cartons were excluded since only few observations were available (n=37). Prices were adjusted for inflation using the general price index from the Bank of Mexico; all price figures are reported in Mexican pesos (MX\$) of April 2012. The exchange rate in April 2012 was MX\$12.99 per US dollar (US\$).

Participants reported the cigarette brands last purchased. We confirmed that data from 2008 (wave 3) were consistent with previously reported 2006 (wave 1) and 2007 (wave 2) data,⁷ showing that the average price of each of the most popular international brands (Marlboro, Camel, Benson) was higher than the average price of each of the most popular national brands (Montana, Delicados, Boots, Raleigh); therefore, the binary classification of international versus national was used as an equivalent of the premium versus discount classification of brands. Less than 3% (n=8 in 2008, n=12 in 2010 and n=33 in 2011) of the smokers reported having bought contraband brands at their last purchase; these cases were excluded from the brand analysis. Contraband brands were defined as those that were not included in the official list of cigarette brands with a permit to be sold in Mexico in each survey year.¹⁸

Standard sociodemographic variables such as age, sex, highest level of education and monthly household income were used as control variables. The seven response options for education were recoded to four (primary school or less, secondary school, high school and graduate or more), as were the seven options for monthly household income (MX\$0 to MX\$3000, MX\$3001 to MX\$5000, more than MX\$5000 and don't know). The number of surveys to which participants had responded was also included as a control variable in order to adjust for any confounding effects due to prior survey participation.

Analyses

Sample characteristics across waves were compared using simple χ^2 tests. Rescaled weights were used to calculate point estimates of average self-reported prices of cigarettes and the proportion of smokers who purchased national brands at last purchase; comparisons of these estimates over time were conducted taking 2010 data as reference and adjusting the p values with Bonferroni's method.¹⁹ Additionally, a population-averaged panel model using generalised estimating equations (GEE) was estimated (normal or Gaussian distribution, identity link function, exchangeable correlation structure),^{20–22} regressing self-reported prices per cigarette at last purchase on type of brand (national or international), format of purchase (pack of cigarettes or single cigarettes), survey wave (dummy coded with 2010 as the reference group) and interactions between time and brand type in order to test whether changes in cigarette prices across waves significantly differed for national brands compared with international brands.

To assess predictors of smoking national/discount brands, a GEE model was also estimated (binomial distribution, logit link function, exchangeable correlation structure), regressing self-reported purchase of national brands at last purchase on socio-demographic covariates and survey wave variables. The distribution of the dependent variables of both GEE models was checked to verify the specifications were adequate.

The statistical software Stata V.11.2 was used for all the analyses.

RESULTS

Sample characteristics

Table 1 shows the characteristics of the sample in each survey wave. Similar demographic characteristics were observed across waves except for education and income level; participants of

wave 4 (2010) and wave 5 (2011) were more likely to be less educated and to have a higher household income than participants of wave 3 (2008). Only one-third of the respondents smoked more than five cigarettes per day, and most of them reported buying packs (76%–82%) and international brands (78%–82%) at their last purchase. The percentage of people who purchased singles at last purchase increased over time (17%–23%).

Price changes over time

The average price of cigarettes increased from MX\$1.60 (95% CI 1.55 to 1.65) per cigarette in 2008 to MX\$1.83 (95% CI 1.78 to 1.88) in 2010 and MX\$2.19 (95% CI 2.14 to 2.25) in 2011. The average price for international brands increased each year, whether purchased as a pack (MX\$1.46 per cigarette in

Table 1 Demographic characteristics and smoking behaviour of sample, ITC Mexico Survey 2008, 2010, 2011 (unweighted means and proportions)

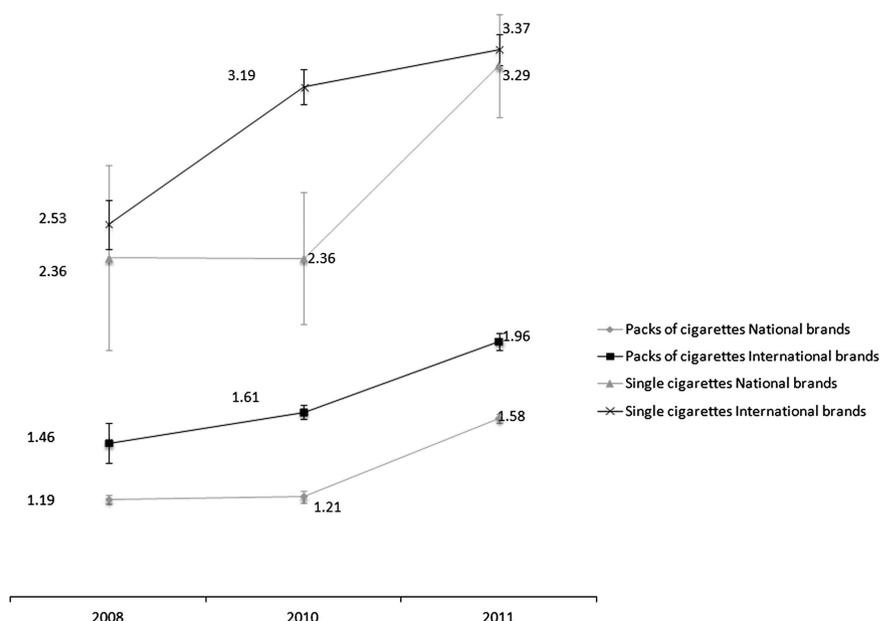
Characteristics	All current smokers at each wave					
	Wave 3 (2008)		Wave 4 (2010)		Wave 5 (2011)	
	n=1644		n=1572		n=1507	
	%/mean	n	%/mean	n	%/mean	n
Age (years)						
18–24	18.55	305	16.67	262	15.76	237
25–39	36.62	602	36.45	573	37.57	565
40–54	28.41	467	28.56	449	29.19	439
55 or more	16.42	270	18.32	288	17.49	263
Sex						
Male	63.14	1038	62.79	987	62.66	943
Female	36.86	606	37.21	585	37.34	562
Education level*						
Primary or less	26.93	440	30.79	484	28.66	431
Secondary	29.38	480	30.79	484	32.05	482
High school	26.99	441	24.36	383	24.73	372
Graduate or more	16.71	273	14.06	221	14.56	219
Monthly household income**						
Low (MX\$0 to MX\$3000)	25.03	409	28.18	443	21.51	324
Medium (MX\$3001 to MX\$5000)	24.54	401	24.62	387	34.00	512
High (MX\$5001 or more)	38.49	629	39.95	628	37.92	571
Don't know	11.93	195	7.25	114	6.57	99
Waves of participation*	2.89	1644	2.95	1567	2.76	1503
Smoking status						
Less than daily	33.9	557	33.04	517	32.02	481
Daily, five cigarettes per day or less	30.55	502	30.29	474	32.29	485
Daily, more than five cigarettes per day	35.54	584	36.68	574	35.69	536
Form of last cigarette purchase**						
Pack of cigarettes	82.31	1349	79.05	1234	76.14	1139
Single cigarette	16.78	275	20.24	316	23.13	346
Carton of cigarette packs	0.92	15	0.70	11	0.74	11
Brand of last cigarette purchase* †						
International	78.42	1272	79.20	1226	82.02	1200
National	21.58	350	20.80	322	17.98	263
Price per cigarette at last purchase**‡						
International brands, packs of cigarettes	1.47	1025	1.61	933	1.93	896
International brands, single cigarettes	2.50	233	3.15	278	3.39	289
National brands, packs of cigarettes	1.16	311	1.21	287	1.60	204
National brands, single cigarettes	2.27	36	2.29	31	3.27	47

*p<0.05, **p<0.01; p values for the association of survey wave and variables.

†International brands include Marlboro, Camel, Benson and other international brands purchased by less than 2% of respondents (eg, Pall Mall, Lucky Strike, Salem); national brands include Montana, Delicados, Boots, Raleigh and other national brands purchased by less than 2% of respondents (eg, Broadway, Alas, Fiesta, Faros).

‡Prices per cigarette are in Mexican pesos (MX\$), adjusted for inflation to April 2012. The exchange rate in April 2012 was MX\$12.99 per US\$.

Figure 1 Self-reported price per cigarette at last purchase, ITC Mexico Survey 2008, 2010 and 2011 (Mexican pesos of April 2012).



2008, MX\$1.61 in 2010 and MX\$1.96 in 2011; $p < 0.01$) or as singles (MX\$2.53, MX\$3.19 and MX\$3.37 per cigarette at each wave; $p < 0.01$) (figure 1). The increase in price for national brands was statistically significant only from 2010 to 2011 ($p < 0.01$ for both packs and singles).

Unlike prices of cigarettes sold in packs, prices of single cigarettes of international and national brands were similar in 2008 and in 2011 (MX\$2.53 and MX\$2.36 in 2008, MX\$3.37 and MX\$3.29 in 2011, respectively; $p > 0.01$) (figure 1), that is, no price differentials across brands were observed in those years for singles.

The results from the GEE price model are consistent with the results described above (table 2): (1) price was lower in 2008 than in 2010 ($B = -0.26$, $p < 0.01$) and higher in 2011 than in 2010 ($B = 0.31$, $p < 0.01$); (2) prices for national brands were lower than prices for international brands ($B = -0.48$, $p < 0.01$); (3) prices of national brands in 2010 were similar to prices of national brands in 2008 (ie, the coefficient for the interaction between national and 2008 was 0.24, which almost completely offsets the main effect for the overall price difference between 2008 and 2010, $B = -0.26$, as described above); (4) prices of

national brands increased from 2010 to 2011 (the coefficient of the interaction national and 2011 was 0.16; $p < 0.01$); and (5) prices per unit of cigarettes sold in packs were lower than prices of single cigarettes ($B = -1.35$; $p < 0.01$).

Predictors of preference for national/discount brands

The percentage of smokers who purchased national brands appeared stable between 2008 (wave 3, 21.7%) and 2010 (wave 4, 22.2%) but dropped in 2011 (wave 5, 19.2%; $p < 0.05$), which likely reflects the impact of the significant specific tax increase that raised the price of national brands relative to the price of international brands in that year.

Among those followed up, the percentage of smokers who switched from international brands to national brands was similar to the percentage of smokers who switched from national brands to international brands (6.2% and 7.7% from 2008 to 2010, respectively, and 4.4% and 6.3% from 2010 to 2011, respectively; $p > 0.01$).

When estimating models to determine factors related to smoking national brands as opposed to international brands, statistically significant correlates included being male and being relatively older, having lower education and lower income, and smoking more heavily (table 3).

DISCUSSION

The study provides further evidence of the effectiveness of excise taxes to increase cigarette prices. After cigarette excise taxes were increased in Mexico, prices went up by 14.0% between 2008 and 2010 and by 20.1% in 2011. However, prices did not increase in equal proportions for all brands. In 2008, the relative price of national brands compared with international brands was 0.81 (MX\$1.19/MX\$1.46) if purchased as a pack or 0.94 (MX\$2.36/MX\$2.53) if purchased as singles, but decreased to approximately 0.75 (MX\$1.21/MX\$1.61 for packs, MX\$2.36/MX\$3.19 for singles) in 2010. Therefore, in response to the low tax increases of 2009 and 2010, the tobacco industry kept prices of cheaper national brands low, while setting higher prices for consumers of relatively higher-priced international brands. It was not until 2011 when the specific tax was significantly increased that the price of national brands was increased by a higher proportion than the price of

Table 2 Weighted GEE model for self-reported price per cigarette at last purchase

Explanatory variables	Coefficient (B)	95% CI
Survey wave		
2008**	-0.26	(-0.30 to -0.22)
2011**	0.31	(0.27 to 0.34)
Brand of last cigarette purchase		
National**	-0.48	(-0.53 to -0.43)
Interactions		
2008_National**	0.24	(1.15 to 1.37)
2011_National**	0.16	(0.09 to 0.24)
Form of last cigarette purchase		
Pack of cigarettes	-1.35	(-1.40 to -1.30)
Observations	4563	

* $p < 0.05$, ** $p < 0.01$.

GEE, generalised estimating equations.

Table 3 Predictors of purchasing national brands, weighted GEE model (dependent variable=1 if brand of last purchase was national)

Explanatory variables	OR	95% CI
Age (years)		
18 to 24	1	
25 to 39	1.51	0.98 to 2.32
40 to 54**	2.59	1.69 to 3.98
55 or more**	4.27	2.72 to 6.72
Sex		
Male	1	
Female**	0.59	0.45 to 0.76
Education		
Primary graduate or less	1	
Secondary**	0.50	0.37 to 0.67
High school graduate**	0.32	0.22 to 0.45
College or more**	0.23	0.15 to 0.34
Income		
Low (MX\$0 to MX\$3000)	1	
Medium (MX\$3001 to MX\$5000)	0.88	0.72 to 1.07
High (MX\$5001 or more)*	0.79	0.63 to 0.99
Don't know	0.92	0.68 to 1.23
Smoking status		
Less than daily	1	
Daily, five cigarettes per day or less	1.22	0.98 to 1.53
Daily, more than five cigarettes per day**	1.68	1.34 to 2.11
Waves of participation**	1.26	1.15 to 1.37
Survey wave		
2008	1.11	0.95 to 1.30
2010	1	
2011	0.93	0.80 to 1.08
Observations	4601	

*p<0.05, **p<0.01.

GEE, generalised estimating equations.

international brands (between 31.3% and 39.6% vs 21.2% to 5.7%, depending on the form of purchase), which resulted in a relative price of national brands above the 2008 value (0.81=MX\$1.58/MX\$1.96 for packs, 0.98=MX\$3.29/MX\$3.37 for singles).

Despite the reduction in the relative price of national brands in 2010, the percentage of smokers who purchased national brands remained stable in that year. This result is consistent with a previous study for Mexico that found no evidence of switching from international brands to national brands after the 2007 tax increase that was also passed onto consumers of international brands to a greater extent.⁷ The increase in the relative price of national brands in 2011, however, led to trading up to international brands, showing that continuing Mexican cigarette smokers seem to have a preference for international brands. Marlboro dominates the Mexican cigarette market with a market share of nearly 50%.

Little is known about pricing of single cigarettes in Mexico. According to the findings of this study, retailers seem to have followed the pricing strategy of the industry as the prices of single cigarettes and packs exhibited a similar pattern. However, while recent taxes were effective in increasing the price of both, single cigarettes may become more widely available, thereby undermining tobacco control by facilitating youth access and cueing smoking behaviour among adults, including those who are trying to quit.^{23 24} The sale of single cigarettes is prohibited

in Mexico since 1999, which is in line with article 16 of the FCTC,¹⁴ but compliance and enforcement is poor. For example, in a sample of stores in Mexico City, 58% sold single cigarettes.²⁵ More recent studies carried out in points of sale around schools indicate that sales of single cigarettes are widespread.^{26 27} Data from this study indicate that between 18% and 22% of the smokers purchase single cigarettes (18.2% in 2008 (wave 3), 20.0% in 2010 (wave 4) and 21.9% in 2011 (wave 5)). If the increase in purchase of singles has been accompanied by greater availability of singles, then tobacco taxes should be accompanied by comprehensive enforcement of other tobacco control policies.

As expected, our results indicate that heavier smokers with lower socioeconomic level are more likely to smoke cheaper national brands. Other studies have found similar results. For example, a study for Canada showed that discount brands and native brands were more popular among youth smokers with relatively less spending money and higher cigarette consumption.²⁸ Another study found that the use of discount cigarettes among adults from the USA was associated with lower household income and higher daily consumption.⁶ In our study, lower education appears more strongly associated with smoking national brands than lower income. Hence, smoking international brands appears to reflect social distinctions and prestige that are above and beyond affordability concerns. These results are important for guiding tobacco control policy oriented towards specific population groups.

Besides national brands, contraband cigarettes constitute an option of cheaper cigarettes for Mexican smokers. According to data used in this study, a low percentage of smokers reported purchasing contraband brands (less than 3%). It was not possible, however, to identify purchases of contraband cigarettes of brands that are legally sold in Mexico (eg, Marlboro or Camel) or other forms of contraband cigarettes such as counterfeit cigarettes. Additional research is required to better understand illicit trade penetration and the characteristics of the smokers who use these types of products.

The study has some limitations. Differences in the sample level of education and income were found across waves. However, the difference for education was not particularly strong, with the biggest difference being between wave 3 (2008) and wave 4 (2010) regarding lower education (26.9% vs 30.8%). On the other hand, the difference for income may reflect increases in income levels over time, mostly moving people from the lowest to the middle category. Decreases in 'don't know' responses for income (from 11.9% in wave 3 (2008) to 7.2% in wave 4 (2010) and 6.6% in wave 5 (2011)) may be due to rapport between interviewer and participant, and trust building over time.

CONCLUSIONS

Tobacco taxes in Mexico were generally accompanied by price increases; however, the relatively low tax increases in 2009 and 2010 appear to have been passed onto consumers who smoked premium/international brands and not to those who smoked national/discount brands, as had been found for a prior assessment of price changes in response to higher ad valorem taxes implemented in 2007.⁷ The 2011 specific tax increase appears to have helped disrupt this market segmentation process, resulting in greater price increases for national brands. Evidence for trading up, from national brands to international brands, was found after the large increase in the specific tax in 2011 that narrowed the price gaps.

These results provide further evidence for the importance of tax policy as a tobacco control strategy, including strategies that

produce price structures that do not encourage smokers to offset tax increases by switching to cheaper brands. In particular, these results illustrate the importance of using specific taxes rather than ad valorem taxes.

It is necessary, however, to adjust the specific tax for inflation in future to avoid decreases in the tax relative to cigarette price.³ Also, considering cigarette taxes in the context of other tobacco control policies should help governments better tackle the tobacco epidemic.

What this paper adds

- ▶ The results of this study provide further evidence of tobacco industry pricing strategies in response to tax increases and changes in tax structure, as well as smokers' responses to resulting price changes.
- ▶ The relatively low tax increases implemented in 2009 and 2010 in Mexico resulted in price increases for premium/international brands. The 2011 tax increase, however, which was a specific tax increase instead of ad valorem as had been the case till 2009 and was much higher than the specific tax increase of 2010, resulted in greater increases in prices of national brands versus international brands. This illustrates the relevance of using specific taxes instead of ad valorem taxes.

Contributors BSdeMJ contributed to the conception and design by proposing research questions and methods to address those questions. She also conducted the data analysis and participated in the drafting. She is responsible for the overall content as guarantor. JFT contributed to the conception and design of the article by proposing research questions and methods. He also participated in the analyses and interpretation of the data, as well as in the drafting. LMRS, MHÁ and FJC participated in the analysis and interpretation of the data. They also revised the article critically. All authors provided approval of the version submitted to Tobacco Control. No one else contributed substantially to the conception, design, analysis, interpretation, drafting and revision of the article.

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Patient consent Obtained.

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税收、价格和卷烟品牌偏好：对ITC项目墨西哥调查中成年吸烟者的纵向研究

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摘要

背景 墨西哥最新的税收提高举措存在结构性的差异，这为更好地了解烟草业的定价策略以及研究吸烟者对价格变化的响应提供了契机。

目的 评估税收是否被转嫁到了不同卷烟品牌的消费者身上、消费者的品牌转换程度和对较廉价国产品牌的偏好预测因素。

方法 我们采用了国际烟草控制政策评估项目墨西哥调查的三轮数据，对消费者上次购烟的自报品牌和支付价格进行了分析，使用广义估计方程来确定国产品牌价格和偏好的预测因素。

结果 从2008年至2011年，高端/国际品牌的平均价格逐年上升，而低价/国产品牌的价格仅在2010年至2011年间有所上升。吸国产品牌的吸烟者比例从2008年至2010年一直保持稳定，2011年有所下降。相比国际品牌，与选择吸国产品牌有关的因素包括性别为男性、年龄较大、受教育程度较低、收入较低和吸烟量较大。

结论 2011年之前，烟草业在墨西哥实行提高从价税定价策略，市场被分割成了低价国产品牌和高端国际品牌两部分。2011年提高从量税后，国产品牌的价格相对于国际品牌有所提高，缩小了两部分市场之间的价格差距。证据显示，2011年提高税收之后出现了消费向上转换的情况。这些结果提供了进一步的证据证明税收政策作为一项烟草控制策略的价值，尤其展示了从量税相对于从价税的重要价值：它可降低卷烟支付能力下降引起的品牌向下转换的可能性。

前言

通过税收手段提高卷烟价格，可以降低吸烟流行率、降低继续吸烟者的吸烟量，以及减少开始吸烟的情况^[1-4]。然而，已有研究同时指出，吸烟者可能通过改变其购买行为比如改吸价格更低的品牌，从而最大限度地抵消税收增加的影响。例如，Tsai等人^[5]发现，2002年台湾提高卷烟税率之后，17.4%的台湾男性吸烟者改吸了价格较低的品牌。此外，Cummins等^[6]根据来自美国20个社区的信息，发现在1988年至1993年间，随着这一时期的税率和价格上升，使用低价品牌的吸烟者比例也从6.2%

上升到了23.4%。然而，此前墨西哥的一项研究并未发现吸烟者采用从国际品牌转换为价格更低的国产品牌这一策略的证据，而这种转换在2007年提高卷烟税后却十分普遍^[7]。同时，Evan和Farrelly根据1979年至1987年的美国数据发现，吸烟者还可能改吸焦油和尼古丁含量更高的卷烟^[8]。

烟草业定价策略也可以削弱增税所产生的效果，比如内部消化掉一部分增税，不将其转嫁给消费者。例如，最近一项研究表明，英国烟草业向不同的价格板块转嫁了不同的税收；2006年至2009年，高价品牌的价格缓慢上升，而低价品牌的价格则始终维持不变，这一现象与低价品牌市场份额大幅度增加有关联^[9]。

近期墨西哥消费税的提高既有从量税成份的税种，也有包括不含从量税的税种。每个税种都可能引发烟草业制定不同的定价策略，从而影响吸烟者的响应，而中低收入国家对这些课题进行的研究不足。从量税是按产品数量征税（如每包卷烟多少比索），而从价税则是按产品货币价值的一定百分比征税（如批发或者零售价格的百分比）。从价税的主要优点是价格增长过程中保留了其实际价值，其不足则在于需要十分强有力的税收征管制度，且容易出现价值低估的情形，并可能加速价格分化，导致品牌转换。另一方面，从量税需要的管理要求相对更低，且不易出现价值低估，但是需要定期调整税额，以保证其实际价值不会受到通货膨胀的影响^[10]。

近年来墨西哥一直在提高卷烟消费税（特别生产与服务税），从2006年批发价格的110%，到2007年的140%，到2008年的150%，再到2009年的160%。此外，2010年在特别生产与服务税基础上，又对每支卷烟增收0.04比索（墨西哥货币单位，折合0.003美元）的从量税，2011年该从量税又提高到0.35比索（折合0.03美元）^[11]。特别生产与服务税（包括从价和从量部分），加上增值税，2006年占了零售价格的54.2%，2007年达到58.7%，2008年达60.2%，2009年达61.4%，2010年达62.7%，2011年达到了68.8%^[12]。

来自墨西哥的数据支持卷烟税收可以有效降低卷烟消费量这一结论^[7,12,13]。数据同时指出，控制着墨西哥98%市场份额的两家烟草公司（菲莫国际和英美烟草）已经把该市场分化

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为了两个板块，一个是低成本的“低价”卷烟，主要由国产品牌构成；另一个是成本明显高一些的“高端”卷烟，主要由国际品牌构成^[7]。这一市场分化过程与2010年前几年开始实施的从价税有关。从量税应能缩小各种品牌间的价格差距，从而遏制卷烟市场的进一步分化。

本次研究的目的是：（1）评估所增加的烟草税收是否被转嫁到了消费者身上，特别是测试国产和国际品牌间不同的影响效果；（2）品牌转换的规模；（3）对国产品牌偏好的各种预测因素。

方法

研究样本

本研究对参加了最近三轮（2008年第三轮、2010年第四轮、2011年第五轮）国际烟草控制政策评估（ITC）项目墨西哥调查的成年吸烟者数据进行了分析。ITC项目墨西哥调查是一项纵向调查，旨在对世界卫生组织（WHO）《烟草控制框架公约》（FCTC）推荐的控烟政策的有效性进行评价^[14-16]。本次研究对参与过所有三轮调查的六个城市（Guadalajara, Mérida, Mexico City, Monterrey, Puebla和Tijuana）的数据进行了分析。每个城市的城区部分采用分层多级抽样，按照人口普查区和街区中的家庭数量确定普查区和街区人群选择概率。被调查家庭通过随机选择，最多不超过四次访问，以确定符合条件的成年吸烟者（18岁以上，每周至少吸烟一次，至少已吸100支烟）。每个家庭最多调查一位女性和一位男性。

抽样权重依据家庭选择概率确定，并根据家庭中的吸烟者人数进行调整，从而使加权估计值对抽样的城区具有代表性。最近三轮ITC项目墨西哥调查的数据分别在2008年11月至12月（1760人）、2010年1月至2月（1840人）和2011年3月至4月（1845人）收集。在2008年调查的1760人中，75%（1309人）在2010年成功进行了随访；在2010年的1840人中，83%在2011年进行了随访（1519人）。为了维持各轮之间样本量的稳定，2010年和2011年分别招募了531名和326名新调查对象，对样本进行补充。样本补充过程采用的是与此前相同的程序，从失访调查对象最多的人口普查区里的街区人群中随机选择。

本研究的分析样本由六个城市当中，每轮自报为当前吸烟者的调查对象构成（第三轮：1644人，第四轮：1572人，第五轮：1505人），其中包括没有参加随访的调查对象（第三至四轮：603人，第四至五轮：393人）以及后期补充样本的调查对象（857人）。如果样本在本次研究变量当中有任何一项数据缺失，则该样本被排除，不纳入分析。本次总共调查4601人轮次。

ITC项目墨西哥调查方案经墨西哥国家公共卫生研究院伦理审查委员会审核批准，所有调查对象在接受调查前均签署了知情同意书。

变量

根据下列问题的答案计算最近一次购买卷烟时每支卷烟的价格：您上次自己购买卷烟时，是买一条、一包、还是单支的卷烟？您当时（为那条/包/支烟）付了多少钱？

按照下列问题的答案对不同的包装支数进行调整：您当时买烟的时候，那包烟里面有多少支？如果没有获得该问题的答案，或者答案数值低于14或高于25^[17]，则认为每包内装20支卷烟（即最常见的包装规格）。鉴于相应观测值总

数很少（ $n=37$ ），整条购买卷烟的吸烟者的价格数据被排除。价格按照墨西哥银行提供的物价总指数进行调整。所有报告的价格数据单位均为2012年4月的墨西哥比索价格（同期墨西哥比索对美元汇率为12.99:1）。

调查对象报告了最近一次购买的卷烟品牌。根据我们的核实，2008年（第三轮调查）的数据与此前报告的2006（第一轮调查）和2007年（第二轮调查）数据一致^[7]，显示最受欢迎的国际品牌（Marlboro、Camel、Benson）的卷烟平均价格均高于最受欢迎的国产品牌（Montana、Delicados、Boots、Raleigh）的平均价格。因此，我们采用国际品牌和国产品牌这样的二元分类法以对等于高端品牌和低价品牌的分类法。不到3%的吸烟者（2008年：8人，2010年：12人，2011年：33人）报告最近一次购买的是走私品牌，这些案例被排除，不做分析。走私品牌是指各调查年度没有列入有许可证、可在墨西哥境内销售的正规卷烟品牌名单的品牌^[18]。

控制变量包括年龄、性别、最高受教育程度和家庭月收入等标准社会人口学变量。原有的七个教育程度答案选项被重新编码成了四个选项（小学或以下、初中、高中、大学本科及以上），原有的七个家庭月收入选项也被重新编码成了四个选项（0-300比索、3001-5000比索、5000比索及以上、不知道）。此外，调查对象参加过的调查次数也被纳入作为一项控制变量，用于调整由于之前参与调查造成的混淆影响。

分析

各轮调查间样本特征采用简单 χ^2 检验进行比较，卷烟的平均自报价格点估计值和最近一次购买的是国产品牌的吸烟者比例采用重标加权计算，使用2010年数据作为参照进行不同时期估计值的比较，其中 p 值采用Bonferroni法进行调整^[19]。同时，采用广义估计方程（GEE）估算人口平均面板模型（正态或高斯分布、身份关联函数、可交换相关结构）^[20-22]，根据品牌类型（国产或国际品牌）、购买方式（以包为单位购买或单支购买）、调查轮次（以2010年作为参考组进行虚拟变量编码）以及时间与品牌类型之间的交互项对自报最近一次购买卷烟的价格进行回归，以检验国产品牌和国际品牌相比，各轮调查之间卷烟价格变化是否有显著差异。

为分析国产/低价品牌的预测因素，根据社会人口协变量和调查轮次变量对自报最近一次购买的国产品牌进行回归，从而对GEE模型（二项分布、logit连接函数、可交换相关结构）进行评估。检查两个GEE模型的因变量分布，以确保统计口径合理。

所有分析均采用Stata V.11.2统计软件进行。

结果

样本特征

表1是各轮调查的样本特征。除教育水平和收入水平两项指标外，各轮调查发现的人口学特征基本相同。第四轮（2010年）和第五轮（2011年）的调查对象教育程度较低，且家庭收入水平高于第三轮（2008年）。仅有1/3的调查对象每天吸烟超过5支，且其中大部分调查对象报告的是整包购烟（76-82%），最近一次购买的卷烟是国际品牌（78-82%）。按支买烟的人数比例随时间有所增加（17%-23%）。

卷烟价格随时间变化

卷烟的平均价格从2008年的1.6比索每支（95% CI: 1.55-1.65）提高到2010年1.83比索每支（95% CI: 1.78-1.88），再到2011年的2.19比索每支（95% CI: 2.14-2.25）。国际品牌的平均价格逐年上升，这种情况存在于无论是整包购买（2008年1.46比索每支，2010年1.61比索每支，2011年1.96比索每支； $p<0.01$ ）或按支购买（每轮价格：2.53, 3.19, 3.37比索每支； $p<0.01$ ）（图1）。国产

品牌的价格上升只在2010至2011年间具有显著的统计学意义（整包购买和按支购买， $p<0.01$ ）。

与整包销售的卷烟价格不同，国产品牌和国际品牌按支销售的卷烟价格在2008年和2011年都很接近（2008年分别为2.53和2.36比索，2011年分别为3.37和3.29比索； $p>0.01$ ）（图1），这两年没有发现按支销售的不同品牌之间存在明显的价格差异。

表1 样本人群的人口学特征和吸烟行为：2008、2010、2011年ITC项目墨西哥调查（未加权平均数和比例）

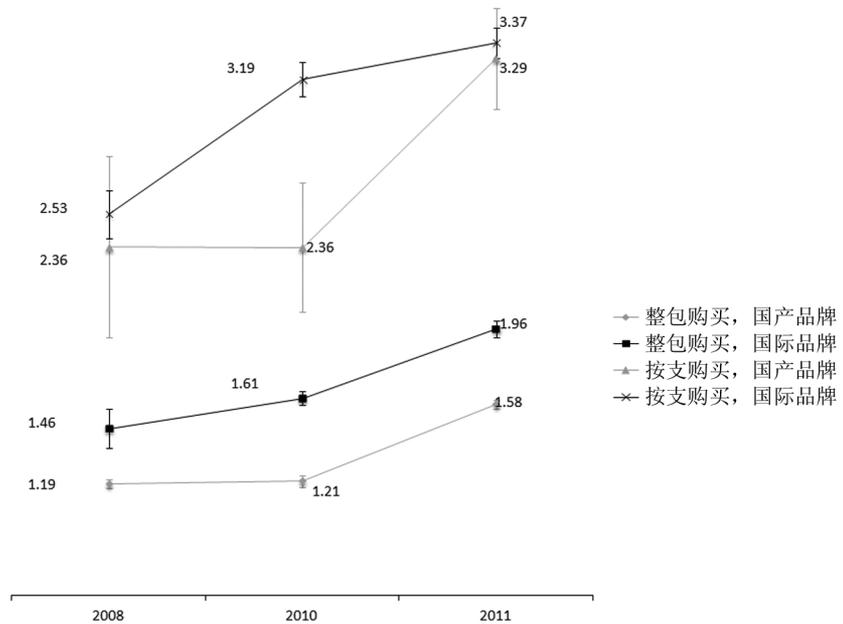
特征	每轮调查的所有当前吸烟者					
	第三轮 (2008)		第四轮 (2010)		第五轮 (2011)	
	人数: 1644		人数: 1572		人数: 1507	
	%/均数	人数	%/均数	人数	%/均数	人数
年龄						
18-24 岁	18.55	305	16.67	262	15.76	237
25-39 岁	36.62	602	36.45	573	37.57	565
40-54 岁	28.41	467	28.56	449	29.19	439
55 岁及以上	16.42	270	18.32	288	17.49	263
性别						
男性	63.14	1,038	62.79	987	62.66	943
女性	36.86	606	37.21	585	37.34	562
受教育程度*						
小学或以下	26.93	440	30.79	484	28.66	431
初中	29.38	480	30.79	484	32.05	482
高中	26.99	441	24.36	383	24.73	372
大学本科及以上	16.71	273	14.06	221	14.56	219
家庭月收入*						
低 (0-3000比索)	25.03	409	28.18	443	21.51	324
中等 (3001-5000比索)	24.54	401	24.62	387	34.00	512
高 (5001或以上)	38.49	629	39.95	628	37.92	571
不知道	11.93	195	7.25	114	6.57	99
参与调查的轮数*	2.89	1,644	2.95	1,567	2.76	1,503
吸烟状况						
不是每天吸烟	33.9	557	33.04	517	32.02	481
每天吸烟5支或更少	30.55	502	30.29	474	32.29	485
每天吸烟5支以上	35.54	584	36.68	574	35.69	536
最近一次购烟的方式**						
整包购买	82.31	1,349	79.05	1,234	76.14	1,139
按支购买	16.78	275	20.24	316	23.13	346
整条购买	0.92	15	0.70	11	0.74	11
最近一次购买的品种* †						
国际品牌	78.42	1,272	79.20	1,226	82.02	1,200
国产品牌	21.58	350	20.80	322	17.98	263
最近一次购烟每支卷烟价格** ‡						
国际品牌, 整包购买	1.47	1,025	1.61	933	1.93	896
国际品牌, 按支购买	2.50	233	3.15	278	3.39	289
国产品牌, 整包购买	1.16	311	1.21	287	1.60	204
国产品牌, 按支购买	2.27	36	2.29	31	3.27	47

* $p<0.05$, ** $p<0.01$; 调查轮次与各变量之间相关性的p值。

†国际品牌包括 Marlboro, Camel, Benson 以及其它购买调查对象少于2%的国际品牌 (如 Pall Mall, Lucky Strike, Salem 等); 国产品牌包括 Montana, Delicados, Boots, Raleigh 和其它购买调查对象少于2%的国产品牌 (如 Broadway, Alas, Fiesta, Faros 等)。

‡价格单位为墨西哥比索, 根据2012年4月通货膨胀率调整。2012年4月墨西哥比索对美元汇率为12.99:1。

图1 自报最近一次购烟每支卷烟价格：2008、2010、2011年ITC项目墨西哥调查（2012年4月墨西哥比索）



GEE价格模型得出的结果与上述结果是一致的（表2）：（1）2008年的价格比2010年低（ $B=-0.26$, $p<0.01$ ），2011年比2010年高（ $B=0.31$, $p<0.01$ ）；（2）国产品牌的价格比国际品牌的价格低（ $B=-0.48$, $p<0.01$ ）；（3）2010年国产品牌的价格与2008年国产品牌的价格相近（国产和2008之间的交互系数为0.24，几乎完全抵消了2008和2010年之间的总体价格差异的主要影响， $B=-0.26$ ，如上述）；（4）国产品牌的价格从2010年到2011年有所上升（国产和2011之间的交互系数为0.16； $p<0.01$ ）；（5）整包销售的卷烟单位价格低于按支销售的卷烟（ $B=-1.35$, $p<0.01$ ）。

国产/低价品牌偏好的预测：购买国产品牌的吸烟者比例在2008年（第三轮，21.7%）到2010年（第四轮，22.2%）之间基本维持了稳定，2011年有所下降（第五轮，19.2%， $p<0.05$ ），这可能反映了大幅提高从量税后的影响，导致当年国产品牌卷烟的价格相对于国际品牌价格上升。

在此后的随访中，从国际品牌转向国产品牌的吸烟者比例与从国产品牌转向国际品牌的吸烟者比例相近（2008年至2010年分别为6.2%和7.7%，2010年至2011年分别为4.4%和6.3%， $p>0.01$ ）。

根据广义估计方程模型确定出的与吸国产品牌而非国际品牌卷烟有关的因素包括：性别为男性、年龄较大、受教育程度和收入水平较低，以及吸烟量更大（表3）。

讨论

本次研究提供了进一步的证据，证明了消费税对于提高卷烟价格的有效性。墨西哥在消费税提高之后，卷烟价格在2008年至2010年间上升了14.0%，到2011年上升了20.1%。然而，各种品牌价格上升的比例并不是相同的。2008年，整包购买的话，国产品牌卷烟的价格相当于国际品牌卷烟价格的0.81（1.19比索/1.46比索），按支购买约为0.94（2.36比索/2.53比索），而2010年这一比例下降到约0.75（整包购买：1.21比索/1.61比索，按支购买：2.36比

表2 最近一次购烟自报每支卷烟价格的加权GEE模型

解释变量	系数 (B)	95%置信区间
调查轮次		
2008**	-0.26	(-0.30 - -0.22)
2011**	0.31	(0.27 - 0.34)
最近一次购买的品种		
国产**	-0.48	(-0.53 - -0.43)
交互项		
2008-国产**	0.24	(1.15 - 1.37)
2011-国产**	0.16	(0.09 - 0.24)
最近一次购烟的方式		
整包购买	-1.35	(-1.40 - -1.30)
观察值	4563	

* $p<0.05$, ** $p<0.01$ 。

GEE: 广义估计方程。

索/3.19比索)。由此可见，针对2009年和2010年幅度较小的增税，烟草业的做法是维持较廉价的国产品牌价格，而提高相对价格更高的国际品牌价格。直到2011年大幅提高从量税后，国产品牌的价格提高比例才超过国际品牌（国产品牌：31.3%到39.6%，国际品牌：21.2%到5.7%，具体比例根据不同的购买方式存在差异）。这也导致了国产品牌的相对价格高于2008年的比值（整包购买：0.81=1.58比索/1.96比索，按支购买：0.98=3.29比索/3.37比索）。

虽然2010年国产品牌的相对价格有所下降，但是当年吸烟者购买国产品牌的比例依然保持稳定。这一结果与之前关于墨西哥的一项研究结果一致：该研究没有发现2007年提高烟税后吸烟者从国际品牌转向国产品牌的证据，且该年的增税很大程度上转嫁给了国际品牌的消费者^[7]。然而，2011年国产品牌相对价格的提高导致了向国际品牌的消费升级，这表明墨西哥吸烟者可能偏好国际品牌。Marlboro占墨西哥卷烟市场将近50%的份额，具有主导地位。

表3 购买国产品牌的预测因素，加权GEE模型（如果最近一次购买的是国产品牌，则因变量为1）

解释变量	OR值	95%置信区间
年龄		
18-24岁	1	
25-39岁	1.51	(0.98-2.32)
40-54岁**	2.59	(1.69-3.98)
55岁及以上**	4.27	(2.72-6.72)
性别		
男性	1	
女性**	0.59	(0.45-0.76)
受教育程度		
小学或以下	1	
初中**	0.50	(0.37-0.67)
高中**	0.32	(0.22-0.45)
大学及以上**	0.23	(0.15-0.34)
收入		
低（0-3000比索）	1	
中（3001-5000）	0.88	(0.72-1.07)
高（5001或以上）*	0.79	(0.63-0.99)
不知道	0.92	(0.68-1.23)
吸烟状况		
不是每天吸烟	1	
每天吸烟5支或以下	1.22	(0.98-1.53)
每天吸烟5支以上**	1.68	(1.34-2.11)
参与调查轮数**	1.26	(1.15-1.37)
调查轮次		
2008	1.11	(0.95-1.30)
2010	1	
2011	0.93	(0.80-1.08)
观察值	4601	

*p<0.05, **p<0.01.
GEE: 广义估计方程。

目前对于墨西哥按支销售的卷烟定价了解还很少。本研究发现，零售商似乎采用了类似烟草业的定价策略，因为按支销售的卷烟所体现出的模式与整包销售相似。不过，虽然最近的增税措施有效地提高了两种购买方式的价格，但是按单支销售的卷烟可能覆盖面更广，从而方便青少年获得卷烟并诱发成年人（包括正在努力戒烟的成年人）的吸烟行为，削弱控烟措施^[23-24]。虽然墨西哥从1999年起就已经禁止按支销售卷烟，这也符合FCTC第十六条的规定，但是法律的遵守和执法情况并不理想。例如，在对墨西哥城的商店进行抽样调查时发现，58%的商店仍在销售单支的卷烟^[25]。其它近期针对学校附近零售点开展的研究显示，按支销售卷烟的做法十分普遍^[26-27]。本次研究的数据显示，约有18%到22%的吸烟者购买单支卷烟（2008第三轮：18.2%，2010年第四轮：20.0%，2011年第五轮：21.9%）。如果单支购买量随着单支卷烟可及性的提高而上升，那么烟草税这一措施就需要其它控烟政策的配套实施。

与之前的预期一致，本次研究的结果显示，吸烟量更大、社会经济水平更低的吸烟者更可能吸价格更低的国产品牌烟。其它相关研究发现的结果与此相似。如加拿大的一项研究显示，低价品牌和国产品牌在可支配现金相对较少、吸

烟量更大的年轻吸烟者中更受欢迎^[28]。另一项研究发现，美国成年人吸低价卷烟与家庭收入较低和每日吸烟量较大之间存在关联^[6]。在本次研究中，受教育程度较低与吸国产卷烟之间的关联比与低收入水平的关联更大。因此，吸国际品牌反映的是对社会认同和声望的考虑，这些考虑已经超过了经济可承受性问题的顾虑。这些结果对于指导制定针对不同人群的控烟政策具有重要意义。

除国产品牌外，走私卷烟也是墨西哥吸烟者低价卷烟来源之一。本研究的数据显示，有少数吸烟者（不到3%）报告购买过走私品牌。不过，我们无法确定在墨西哥合法销售的品牌（如Marlboro或Camel）是否为走私烟及其是否存在其它非法形式（如假冒卷烟等）。需进一步的研究以更好地了解非法贸易渗透程度和使用这类型产品的吸烟者的特征。

本次研究存在一些局限。各轮调查对象的受教育水平和收入水平存在差异。不过受教育程度方面的差异并不特别明显，其中第三轮（2008）和第四轮（2010）在低等教育（26.9%和30.8%）方面差异最大。另一方面，收入水平的差异可能反映的是收入随时间的增长，几乎把人们从最低级别提高到了中等级别。对于收入问题回答“不知道”的调查对象比例从第三轮（2008）的11.9%下降到第四轮（2010）的7.2%，以及第五轮（2011）的6.6%，这可能与调查员与调查对象之间随时间逐步建立了融洽关系以及信任有关。

结论

墨西哥调整烟草税率基本上都会伴随价格的提高，但是2009年和2010年相对较小的增税似乎大都被转嫁到了吸高端/国际品牌卷烟的消费者身上，而不是吸国产/低价品牌的消费者。这种情形与对2007年大幅提高从价税后所导致的价格变化的评估结果一致^[7]。2011年增加从量税的措施似乎帮助打破了这一市场分割的过程，导致国产品牌的价格上涨更多。证据显示，2011年大幅提高从量税，从而缩小价格差距之后，出现了从国产品牌到国际品牌的消费升级。

本文研究的结果为税收政策作为控烟策略的重要性提供了进一步的证据，包括形成不激励吸烟者改吸低价品牌以抵消增税效用的价格结构的策略。这些研究结果尤其展示了应采用从量税而非从价税的重要性。

不过，未来需要对从量税按照通货膨胀水平进行相应调整，以避免其相对于卷烟价格的降低^[9]。同时，应将卷烟税策略放在其它控烟政策的大背景下来考虑，这有助于各国政府更好地遏制烟草危害。

本文贡献

- ▶ 本研究结果提供了进一步的证据，揭示烟草业应对烟草税提高和税收结构变化的定价政策，以及吸烟者对相应价格变化的反应。
- ▶ 2009年和2010年实施的相对较低的增税措施导致高端/国际品牌卷烟价格上升。而2011年烟税提高的是从量税而非从价税（2009年之前一直是提高从价税），且比2010年的从量税提高幅度高很多，从而导致国产品牌相对国际品牌价格提高得更多。这一现象显示了采用从量税而非从价税的重要性。

贡献

BSdeMJ提出了研究问题和解决问题的方法, 为研究理念和设计做出了贡献, 同时她还负责进行数据分析, 参与撰稿, 并充当主题内容的担保人。JFT提出了研究问题和方法, 为研究理念和设计做出了贡献, 同时他还参与了数据分析和解读及撰稿。LMRS、MHÁ和FJC参与了数据分析和解读, 并对初稿进行了修改。所有作者均同意将本稿投往《烟草控制》杂志。无他人对本文的理念、设计、分析、解读、撰写和修改做出显著贡献。

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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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