Effect of price changes in little cigars and cigarettes on little cigar sales: USA, Q4 2011–Q4 2013

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Abstract

Introduction—Little cigars are comparable to cigarettes in terms of shape, size, filters and packaging. Disproportionate tobacco excise taxes, which directly affect purchase price, may lead consumers to substitute cigarettes with less expensive little cigars. This study estimated the effects of little cigar and cigarette prices on little cigar sales.

Methods—Sales data from a customised retail scanner database were used to model a log–log equation to infer own-price and cross-price elasticity of demand for little cigars relative to little cigar and cigarette prices, respectively, from quarter 4 of 2011 to quarter 4 of 2013. Data were available for convenience stores (C-stores) (n=29 states); food, drug and mass merchandisers (FDMs) (n=44 states); and C-stores and FDMs combined (n=27 states). The dependent variable was per capita little cigar pack sales, and key independent variables were the price index for little cigars and cigarettes.

Results—A 10% increase in little cigar price was associated with a 25% (p<0.01) decrease in little cigar sales in C-stores alone, and a 31.7% (p<0.01) decrease in C-stores and FDMs combined. A 10% increase in cigarette price was associated with a 21.5% (p<0.05) increase in little cigar sales in C-stores, and a 27.3% (p<0.01) increase in C-stores and FDMs combined.

Conclusions—Our results suggest that US cigarette smokers are avoiding the high cost of cigarettes by switching to lower priced little cigars. Increasing and equalising prices among comparable products, like cigarettes and little cigars, may motivate cost-conscious smokers to quit.

INTRODUCTION

Tobacco use remains the leading cause of preventable death and disease in the USA, which the US Surgeon General has concluded is overwhelmingly caused by cigarettes and other combusted tobacco products, such as cigars.[1] Cigar smoke contains the same toxic and carcinogenic compounds as the cigarettes and therefore, cigars are not a safe alternative to cigarettes.[1–5] Both cigarettes and cigars contain nicotine and are addictive.[24] Like smoking cigarettes, smoking cigars too is linked to coronary heart disease (CHD); chronic obstructive pulmonary disease (COPD); and cancers of the oral cavity, oesophagus, larynx and lungs.[4–8] Little cigars are often inhaled similarly to cigarettes,[910] and regular cigar smokers who inhale, particularly those who smoke several cigars per day, are at a higher risk of developing CHD and COPD than are cigar smokers who do not inhale.[4] Additionally, cigar little cigars smokers who also smoke cigarettes are more likely to inhale cigar smoke, which increases the risk of death.[4]

In recent decades, the prevalence of cigarette smoking has decreased substantially in the USA, while the prevalence of cigar and other tobacco product use has remained steady.[11] During 2012–2013, an estimated 5.8% of US adults smoked cigars every day, some days or rarely, and 2% smoked cigars every day or on some days.[12] Among adults who smoked cigars at least rarely and identified a usual cigar type, 18.3% used little filtered cigars and 75% also smoked cigarettes.[13] During 2000–2011, cigarette consumption decreased by 32.8%, while large cigar consumption increased by 233% and little cigar consumption decreased by 65%.[14]

Under the 2009 Children's Health Insurance Program Reauthorization Act (CHIPRA), federal taxes were increased on cigarettes, little cigars, large cigars, roll-your-own (RYO) tobacco and pipe tobacco; however, the tax increases were not uniform and have led to unintended consequences.[1415] The tax increase equalised taxes on cigarettes, little cigars and RYO tobacco. The tax rate on large cigars increased too but, depending on price, can be significantly lower than the tax on little cigars. As the federal tax code classifies little cigars and large cigars only by weight, differences in tax rates between little cigars (eg, Swisher Sweets Little Cigars) and large cigars (eg, Dutch Masters Palma Cigars) create an incentive for cigar manufacturers to add weight to their little cigars so that these qualify as large cigars for tax purposes though they still remain functionally identical to little cigars. Equalising the tax on cigarettes and little cigars would be expected to reduce consumers' ability to substitute little cigars for cigarettes when cigarette prices increase; however, the difference between little and large cigar taxes could negate this outcome.

Little cigars are similar to cigarettes in terms of shape, size, filters and packaging (figure 1).[16] Little cigars can also be manufactured, distributed, and sold with flavours (eg, fruit) that are otherwise prohibited for cigarettes in the USA.[13] During 2008–2011, cigar sales when taxed as little cigars decreased by 86.4%, whereas cigar sales taxed as large cigars increased by 126.3%.[15] The decrease in little cigar sales and increase in large cigar sales following CHIPRA was most likely not because consumers changed preferences, but rather the result of manufacturers manipulating the weight of little cigars so they would qualify as

large cigars for tax purposes.[15] In this paper, retail scanner data identify little cigar sales by product and packaging characteristics, regardless of their weight.

In the 1960s, in the face of increased cigarette regulation and declining sales, tobacco companies began marketing cigars that imitated cigarettes in size, shape and filter; between 1971 and 1973, little cigar sales quadrupled.[9] Understanding the demand for little cigars, especially with respect to cigarettes, will help regulators reduce opportunities for consumers to switch between tobacco products to maintain their level of tobacco consumption when prices on their preferred product increase. Little is currently known about whether smokers substitute little cigars for cigarettes because of price changes. If consumers place a similar value on cigarettes and little cigars, and if they can buy little cigars for less than cigarettes, consumers have an incentive to buy little cigars and save money. The own-price elasticity of little cigars reveals how product sales respond to changes in product price. The estimate's sign indicates the direction of the relationship, and the estimate's size indicates the strength of the association. A large, negative own-price elasticity, for example, indicates that an increase in little cigar prices greatly reduces little cigar sales. Similarly, the cross-price elasticity of little cigars with respect to cigarettes measures how little cigar sales respond to changes in cigarette prices; for example, a large, positive cross-price elasticity indicates than an increase in cigarette price greatly increases little cigar sales. One study used monthly national retail scanner data from September 2006 to September 2008 to estimate own-price and cross-price elasticity of demand for cigarettes, cigars, smokeless tobacco and roll-your-own and pipe tobacco.[17] This analysis estimated a cigar own-price elasticity of –0.50, and a cross-price elasticity of cigars with respect to cigarettes of 0.40, suggesting that cigarettes and cigars are substitutes. However, the relationship between own-price and cross-price elasticity of demand for little cigars and cigarettes following CHIPRA is uncertain. To address these research gaps, this study used quarterly retail sales data for 2011 to 2013 to assess own-price and cross-price elasticity of demand for little cigars sold in US states.

METHODS

Data sources

Retail scanner data—We obtained tobacco sales data from a custom-designed database of retail scanner data provided by Information Resources, Inc (IRI) (http://www.iriworldwide.com/SolutionsandServices/). The database contained Universal Product Code-level dollar and unit sales for cigarettes and little cigars in convenience stores (C-stores) (eg, 7-Eleven, Circle K) and food, drug and mass merchandisers (FDMs) (eg, Kroger, CVS, Target) from quarter four of 2011 (Q4 2011) through quarter four of 2013 (Q4 2013). Each item included product description, brand name, product type, product shape and number of items in the unit (eg, 20 little cigars). Data were obtained for the whole of US and all states with sufficient store sample sizes for IRI to create stable estimates based on their proprietary weighting methods. C-store data were available for 29 states, and FDM data were available for 44 states. Before Q4 2012, C-store data were not available for South Carolina and FDM data were not available for Arkansas, Idaho, South Dakota, and Wyoming. These data were missing because IRI was unable to provide sales and price estimates. In-state variation between prices and little cigar sales would have to be different

for those particular quarters in those particular states for the missing data to cause bias in our estimates. We found no evidence from either literature or the available data that the effect of cigarette and little cigar prices on little cigar sales was different for these states in these quarters; therefore, we believe that missing data have not biased the results of our analysis. Adhikari *et al*[18] describe the retail scanner data in detail.

Population characteristics—We obtained data on each state's population by race/ ethnicity and age group for 2012, and the 2-year moving average median household income for 2011–2012, in 2012 US dollars, from the US Census Bureau.[19][20] We obtained data on monthly state unemployment rates that were not seasonally adjusted from the Bureau of Labor Statistics and averaged these into quarterly rates.[21]

Smoke-free laws—Data on state smoke-free air laws were obtained from the American Non-smokers' Rights Foundation.[22] The Foundation reports enactment dates for laws on 100% smoke-free workplaces, restaurants or freestanding bars across all US municipalities (eg, cities, counties, states). We calculated the percentage of each state's population covered by the comprehensive smoke-free air laws (ie, covers restaurants, bars and workplaces); population coverage is 100% for states with statewide coverage.

Tobacco control programme funding—Estimates of annual state tobacco control programme (TCP) funding employed data from federal and state sources, and accounted for funding from the Centers for Disease Control and Prevention, excise tax earmarks for tobacco control, state settlement and Master Settlement Agreement sources and other state appropriations. These data are described in detail by Farrelly *et al*.[23][24]

Measures

Scanner data allow us to classify products as little cigars using the product's description, brand, size and shape rather than weight. Cigars were coded as 'little' if the shape or product description read 'little cigar', and excluded characteristics of large cigars or cigarillos, like 'blunt' or 'cigarillo'. Of the products identified as little cigars, 61% contained 20 little cigars per unit (a pack), and 20.1% contained 200 little cigars per unit (a carton). This is consistent with previously published results confirming that little cigars are most often sold in packs of 20.[23] We compared brands of little cigars reported to be made heavier ('fattened'), presumably to qualify as large cigars for tax purposes, with brands from the scanner data and found these brands were correctly identified as little cigars in the scanner data set.[25] IRI scanner data do not provide information about whether cigars are filtered; therefore, we searched online for every brand classified as a little cigar and removed from the data set any items we could not confirm as being filtered. Henceforth, we refer to filtered little cigars as 'little cigars'. Little cigar and cigarette sales were standardised so that each unit equalled 20 little cigars or cigarettes per pack. The amount of tobacco in a cigar approximately determines the level of nicotine; therefore, the nicotine content of a single cigar can be as little as the amount in a single cigarette to as much as the amount in a pack or more of cigarettes.[4] Since little cigars and cigarettes are virtually equal in size, we assumed that 20 little cigars are equivalent to 20 cigarettes with regard to the amount of tobacco or nicotine. The average price per pack of cigarettes and per pack of little cigars was calculated by

dividing dollar sales by pack sales. Dollars were not adjusted for inflation. Per capita pack sales for little cigars were calculated by dividing pack sales by the population for each state and year.

Price indices for little cigars and cigarettes were used in place of raw prices. Price indices account for smokers substituting between premium and discount brands when prices increase, and allow us to use category data rather than brand data to estimate demand models.[26] Without controlling for consumers substituting between premium and discount brands, the coefficient estimates on price may suffer from endogeneity bias. In a regression analysis with average price as the value measure, the results may erroneously show that smokers are not responsive to price changes.[27]

Analysis

All analyses were conducted using Stata/MP 13.1 for Unix.[28] Using a log–log demand model, per capita little cigar pack sales were regressed on the price indices for little cigars and cigarettes to estimate the own-price elasticity of little cigar sales with respect to little cigar prices and the cross-price elasticity of little cigar sales with respect to cigarette prices. Coefficient estimates of a log–log model are elasticities, which are a ratio of the percentage change in the outcome to the percentage change in the covariate (eg, cigarette price). For example, if the coefficient on the little cigar price index is −1.2, then a 10% increase in little cigar price will decrease little cigar pack sales by 12%, with everything else being held constant.

Three equations were estimated: (1) C-stores (29 states), (2) FDMs (44 states) and (3) both C-stores and FDMs combined (27 states). The main model controlled for state differences by using fixed effects, changes over time by using yearly indicator variables and seasonality by using quarterly indicator variables. We estimated an alternate model that used state demographic characteristics (ie, age, race, median income, unemployment rate) and tobacco control interventions (ie, TCP funding, percentage of the state covered by smoke-free laws) in place of state fixed effects.

RESULTS

Average price

In Q4 2013, the national average pack price in C-stores was 37.3% less for little cigars than for cigarettes (table 1). In FDMs, the average pack price was 31.5% less for little cigars than for cigarettes.

In C-stores, Oregon had the highest average pack price of little cigars ($8.65), and New York had the highest average pack price of cigarettes ($9.43). C-store prices for little cigars and cigarettes were most similar in Tennessee, $4.33 and $4.29, respectively. C-store prices for little cigars and cigarettes were most dissimilar in Florida, $1.37 and $5.18, respectively.

In FDMs, Rhode Island had the highest average pack price of little cigars ($11.02), and New York had the highest average pack price of cigarettes ($9.72). FDM prices for little cigars and cigarettes were most similar in Minnesota, $7.43 and $7.57, respectively. Like C-stores,

FDM prices for little cigars and cigarettes were most dissimilar in Florida, $1.49 and $5.27, respectively. Notable differences were found in the average price of little cigars in some states between C-stores and FDMs, possibly because of differences in product offerings and consumer preferences.

Price elasticities

There is a significant negative correlation between little cigar price and little cigar sales in C-stores, FDMs, and C-stores and FDMs combined (table 2). In C-stores, a 10% increase in the price of little cigars was associated with a 25% decrease in per capita little cigar pack sales (p<0.01), while a 10% increase in the price of cigarettes was associated with a 21.5% increase in per capita little cigar pack sales (p<0.05). In FDMs, a 10% increase in the price of little cigars was associated with a 12% decrease in per capita little cigar pack sales (p<0.01), and a 10% increase in the price of cigarettes was associated with a 16.9% decrease in per capita little cigar pack sales (p<0.01). In C-stores and FDMs combined, a 10% increase in the price of little cigars was associated with a 31.7% decrease in per capita little cigar pack sales (p<0.01), while a 10% increase in the price of cigarettes was associated with a 27.3% increase in per capita little cigar pack sales (p<0.01). The adjusted R^2s are well above 90%, suggesting the model is a good fit for estimating little cigar sales.

Table 3 presents the findings from the alternate model, where state fixed effects were replaced with state characteristics to test the sensitivity of the price elasticities. The alternate model corrects the inconsistency in estimated cross-price elasticity. In C-stores, a 10% increase in the price of little cigars was associated with a 41.4% decrease in per capita little cigar pack sales (p<0.01), while a 10% increase in the price of cigarettes was associated with a 24% increase in per capita little cigar pack sales (p<0.01). In FDMs, a 10% increase in the price of little cigars was associated with a 37.3% decrease in per capita little cigar pack sales (p<0.01), and a 10% increase in the price of cigarettes was associated with a 5.2% increase in per capita little cigar sales (p<0.25). In C-stores and FDMs combined, a 10% increase in the price of little cigars was associated with a 51.3% decrease in per capita little cigar pack sales (p<0.01), while a 10% increase in the price of cigarettes was associated with a 37.4% increase in per capita little cigar pack sales (p<0.01). The adjusted R^2 are lower than in the main model, suggesting that the alternate model explains less of the variation in little cigar sales, which may be due to uncontrolled state variations.

DISCUSSION

This study is the first to use state-level retail scanner data to assess the effect of little cigar and cigarette prices on little cigar sales. In Q4 2013, the average pack price in C-stores was 37.3% less for little cigars ($3.43) than for cigarettes ($5.47). Similarly, in FDMs, the average pack price was 31.5% less for little cigars ($3.82) than for cigarettes ($5.58). Model results show that an increase in little cigar price was associated with a significant decrease in little cigar sales in C-stores, FDMs and C-stores and FDMs combined. An increase in cigarette price was also significantly associated with an increase in little cigar sales in C-stores, and in C-stores and FDMs combined. These findings suggest that cigarette and little cigar smokers are price sensitive and that, post-CHIPRA, cigarette smokers are avoiding the

higher cost of cigarettes by switching to little cigars. Substitution between cigarettes and little cigars provides a mechanism for cigarette smokers to maintain tobacco consumption when cigarette prices rise. Minimising the tax policy differences between little cigars and cigarettes has the potential to limit tax avoidance behaviour, reduce continued tobacco product use and motivate quit attempts.

Results for FDMs alone were counter to results for FDMs plus C-stores or C-stores alone. In FDMs, we found a negative or insignificant effect of cigarette price on little cigar sales, possibly due to the different product mix and sales patterns between FDMs and C-stores. FDMs primarily sell tobacco products in bulk (eg, cartons of little cigars), whereas C-stores primarily sell single items (eg, single packs of little cigars). C-stores dominate tobacco sales; for example, our data show that little cigar sales were seven times higher in C-stores than in FDMs during the study period. As a result of these factors, little cigar sales in FDMs may be less sensitive to changes in cigarette prices than sales in C-stores. C-store sales are likely the driving force behind the combined model estimates, explaining the consistency of the results between C-stores only, and C-stores and FDMs combined. Furthermore, people may substitute between C-stores and FDMs when prices rise; so the combined store model shows the intuitive direction of little cigar sales with respect to cigarette price.

Tax differences between products at the federal and state levels can create unintended consequences. Little cigars are taxed at the rate of cigarettes at the federal level and in 17 of 50 states.[29] Florida does not tax cigars, and the remaining states tax cigars as a percentage of the wholesale or manufacture price.[29] Even in states that tax little cigars the same as cigarettes, differences can exist if little cigars are defined only by weight. The federal code defines little cigars only by weight. Evidence suggests that, post-CHIPRA, manufacturers have increased the weight but not the size or shape of little cigars, so as to avoid the higher tax on little cigars.[15] To increase the weight, manufacturers pack the tobacco more tightly or add other ingredients, such as the same type of clay used in waste treatment and cat litter.[15,30]

Federal and state definitions of little cigars for taxation purposes do not reflect how little cigars are marketed and sold to consumers. Since cigar manufacturers manipulate cigar weights for tax purposes, taxable sales data have limited use in understanding little cigar consumption.[15] Retail scanner data provide information about what is actually on the cigar package, that is, what is visible to consumers making the purchases. Cigars labelled and marketed as 'little cigars' may, in fact, qualify as large cigars for tax purposes; however, consumers purchasing cigars are not necessarily aware of this information. Thus, scanner data more accurately measure little cigar consumption than the federal or state tax data.

Our findings suggest that US cigarette smokers may be avoiding the rising cost of cigarettes by switching to little cigars. When comparing our findings to previous estimates,[14,17,31] consumer tax avoidance through product substitution appears to have increased since CHIPRA implementation. The elasticity estimates for little cigar demand presented here are higher than previously published elasticities,[17,31] indicating that little cigar sales in C-stores and FDMs are more sensitive to price changes than total little cigar sales aggregated across all retail outlets.

The scanner data used in our analyses do not include sales from Walmart, club stores (eg, Sam's Club, BJ's), dollar stores, specialty/tobacco shops or online sources. Shifting of sales away from C-stores and FDMs to retail outlets that are not captured by the scanner data could bias the elasticity estimates upward since we cannot account for consumers who buy little cigars in outlets other than C-stores and FDMs when prices rise. This could give the false appearance that little cigar sales declined, when in reality these just occurred in outlets not included in our scanner data. The elasticity estimates may also be higher than expected because we analysed direct sales data that are not subject to consumers' self-report bias, whose reports form the basis of other elasticity studies. Finally, we expect our elasticity estimates for little cigar demand to be larger than the average elasticity estimates for cigarette demand because little cigars make up a much smaller proportion of total tobacco sales and are, thus, potentially more sensitive to price changes.[14]

Continued research is warranted to understand the interplay of little cigar and cigarette prices on little cigar sales to help guide tobacco prevention and control policy, planning and practice. A reasonable next step is to estimate the price elasticity of little cigars and the cross-price elasticity of little cigars with respect to cigarettes for each state with available data. This information could help state TCPs to better understand the effect of state-specific policies on efforts to reduce tobacco use. Linking price information from scanner data to survey data with information on dual use of cigars and cigarettes could also help illuminate sociodemographic differences in the propensity to substitute little cigars for cigarettes in the face of rising cigarette prices.

This study is subject to some limitations. First, the analysis was limited to accessible scanner data, which were available for 29 states with C-store data, 44 states with FDM data and 27 states with data on both store types. Second, retail sales do not correspond directly with consumption as people can stockpile items for later use. However, in the case of goods like tobacco, retail sales more accurately measure consumption than do personal consumption expenditure estimates.[32] Third, scanner data do not provide information about whether cigars are filtered; therefore, we relied on online searches of cigars classified as little in our data set to determine whether they were filtered.

Our results reveal that the average cost of cigarettes was much higher in many states than the cost of little cigars and in most cases, little cigar sales were sensitive to price changes in little cigars and cigarettes. Specifically, an increase in little cigar price decreased little cigar sales, and an increase in cigarette price, often accomplished through state-level increases in cigarette taxes, increased little cigar sales, except in FDMs. Increasing the tobacco product prices is the most effective way to reduce consumption.[1] However, policies that only increase a single tobacco product's price allow tobacco users to substitute it with a lower priced product, thus mitigating financial incentives for quitting tobacco use completely. Sales of lower priced and less-regulated tobacco products, like cigars, are increasing, while sales of cigarettes are declining.[14] Federal and state tobacco taxes should be applied equally to remove economically viable alternatives to tobacco users and to provide an incentive to quit tobacco use completely.

Acknowledgements

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What this paper adds

▸ Little cigars are comparable to cigarettes in terms of shape, size, filters and packaging.

▸ In most US states, little cigars are taxed at a lower rate than cigarettes but at a higher rate than large cigars.

▸ At the federal level, little cigars are being taxed as large cigars if they weigh more than 3 pounds per 1000 sticks; so manufacturers have increased the weight of little cigars to reduce the tax and price of these products, thus making these a less expensive substitute for cigarettes.

▸ Unequal excise tax rates for little cigars and cigarettes may encourage cigarette smokers to switch to little cigars, taxed as large cigars, instead of reducing consumption or quitting smoking tobacco products when the price of cigarettes increases.

▸ This is the first study to estimate the effect of price changes for little cigars and cigarettes on sales of little cigars.

▸ We use custom state-level retail scanner data from convenience stores and food, drug and mass merchandisers to estimate models of the demand for little cigars.

▸ In most states, the price per pack of cigarettes is higher than the price per pack of little cigars as a result of unequal excise tax rates.

▸ Increasing little cigar prices reduces little cigar sales, while increasing cigarette prices increases little cigar sales, suggesting that price-sensitive smokers may switch to using little cigars when the price of cigarettes goes up.
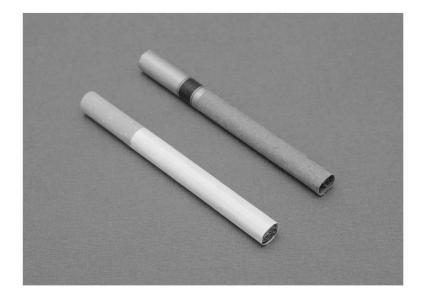
Figure 1.
Little cigars (right) are similar to cigarettes (left) with respect to size, shape, filter and packaging. Source: John H Theilgard, RTI International.

Table 1

Average price per pack of little cigars and cigarettes in US states with sufficient data, Q4 2013

State	C-stores			FDMs		
	Average price per pack of little cigars	Average price per pack of cigarettes	Price difference (%)	Average price per pack of little cigars	Average price per pack of cigarettes	Price difference (%)
Average of states	$3.43	$5.47	37.3	$3.82	$5.58	31.5
Alabama	$2.29	$4.33	47.1	$5.20	$4.29	−21.4
Arizona	$5.74	$6.27	8.5	$5.73	$6.21	7.7
Arkansas	$3.43	$5.08	32.4	$2.07	$4.65	55.6
California	$6.25	$5.47	−14.3	$5.43	$5.19	−4.7
Colorado	$5.02	$5.10	1.7	$3.53	$4.85	27.2
Connecticut	_ *	–	–	$4.35	$7.90	44.9
Delaware	–	–	–	$2.51	$5.52	54.5
Florida	$1.37	$5.18	73.5	$1.49	$5.27	71.7
Georgia	$2.06	$4.27	51.7	$2.26	$4.05	44.2
Idaho	–	–	–	$5.21	$4.49	−16.0
Illinois	$4.40	$6.24	29.5	$4.67	$6.56	28.8
Indiana	$2.11	$4.90	56.9	$1.94	$4.95	60.8
Iowa	$2.23	$5.25	57.5	–	–	–
Kansas	–	–	–	$1.86	$4.54	58.9
Kentucky	$1.70	$4.11	58.8	$1.79	$4.06	55.8
Louisiana	$2.20	$4.46	50.8	$3.60	$4.31	16.6
Maine	–	–	–	$2.06	$6.27	67.2
Maryland	$2.70	$6.03	55.2	$4.72	$6.23	24.3
Massachusetts	$3.01	$8.96	66.4	$2.78	$9.13	69.5
Michigan	$2.23	$5.91	62.3	$2.07	$5.92	65.0
Minnesota	–	–	–	$7.43	$7.57	1.8
Mississippi	–	–	–	$1.63	$4.45	63.4
Missouri	$2.49	$3.75	33.7	$1.88	$3.32	43.3
Nebraska	–	–	–	$1.81	$4.75	61.9
Nevada	$4.20	$5.05	16.9	$5.12	$4.92	−4.0
New Hampshire	–	–	–	$3.47	$5.48	36.6
New Jersey	–	–	–	$4.86	$7.35	34.0
New Mexico	–	–	–	$3.67	$5.78	36.5
New York	$7.53	$9.43	20.2	$8.80	$9.72	9.4
North Carolina	$1.38	$4.25	67.6	$1.75	$4.22	58.5
Ohio	$2.43	$4.99	51.3	$2.39	$5.19	54.0
Oklahoma	$5.09	$5.03	−1.2	$4.72	$5.04	6.3
Oregon	$8.65	$5.86	−47.8	$5.83	$5.53	−5.4
Pennsylvania	$3.13	$5.62	44.4	$4.02	$5.77	30.5
Rhode Island	–	–	–	$11.02	$7.78	−41.5
South Carolina	$1.70	$4.54	62.6	$1.63	$4.36	62.5

State	C-stores			FDMs		
	Average price per pack of little cigars	Average price per pack of cigarettes	Price difference (%)	Average price per pack of little cigars	Average price per pack of cigarettes	Price difference (%)
South Dakota	–	–	–	$2.10	$5.60	62.5
Tennessee	$4.33	$4.29	−0.8	$3.43	$4.24	19.0
Texas	$1.96	$5.62	65.2	–	–	–
Utah	–	–	–	$4.08	$5.66	27.9
Vermont	–	–	–	$4.69	$7.10	34.0
Virginia	$1.78	$4.42	59.8	$2.41	$4.46	46.0
Washington	$5.21	$7.58	31.3	$8.26	$7.74	−6.7
West Virginia	–	–	–	$2.81	$4.14	32.2
Wisconsin	$2.92	$6.60	55.7	$2.81	$6.53	56.9
Wyoming	–	–	–	$4.10	$4.59	10.7

C-stores, convenience stores; FDMs, food, drug and mass merchandisers.

[*] Scanner data were not available for some states.

Table 2

Log–log regression measuring the effect of cigarette and little cigar prices on per capita little cigar sales, Q4 2011–Q4 2013 [*]

Per capita little cigar pack sales (20 sticks)	Coefficient (SE)		
	C-stores	FDMs	C-stores and FDMs combined
Little cigar price index	−2.50[†] (0.35)	−1.20[†] (0.20)	−3.17[†] (0.34)
Cigarette price index	2.15[‡] (0.96)	−1.69[†] (0.34)	2.73[†] (0.83)
N	257	380	235
Adjusted R^2	95%	98%	96%

C-stores, convenience stores; FDMs, food, drug and mass merchandisers.

[†]
p<0.01;

[‡]
p<0.05.

[*]
State fixed effects were used to control for state-level differences, and year and quarter indicators were used to control for trends and seasonality, respectively.

Table 3

Alternate model of log–log regression measuring the effect of cigarette and little cigar prices on per capita little cigar sales, Q4 2011–Q4 2013[*]

Per capita little cigar pack sales (20 sticks)	Coefficient (SE)		
	C-stores	FDMs	C-stores and FDMs combined
Little cigar price index	−4.14[†] (0.34)	−3.73[†] (0.37)	−5.13[†] (0.36)
Cigarette price index	2.40[†] (0.42)	0.52 (0.41)	3.74[†] (0.44)
N	257	380	235
Adjusted R^2	64%	64%	73%

‡ $p<0.05$.

C-stores, convenience stores; FDMs, food, drug and mass merchandisers.

[†] $p<0.01$;

[*] The alternate model controls for state-level differences using state-level data on age, race/ethnicity, median household income, tobacco control programme funding and the percentage of the state covered by any smoke-free air law, unlike the main model which uses state dummy variables to control for state-level differences.