Economic Impact Analysis of Flavored Tobacco and No Tobacco Sales Policies

Comprehensive Report

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DISCLAIMER

All estimates and analyses in this report are by the authors and not by the Nielsen Corporation. Researchers' analyses were calculated (or derived) based in part on data from Nielsen Consumer LLC and marketing databases provided through the NielsenIQ data sets. The conclusions drawn from the NielsenIQ data are those of the researchers and do not reflect the views of NielsenIQ. NielsenIQ is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

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1. INTRODUCTION

A. Background

In response to growing public health concerns over tobacco products' appeal to youth and their role in increasing youth tobacco use nationwide, local and state governments across the United States (US) have enacted sales restrictions on flavored tobacco products. California has been at the forefront of this movement. By 2022, more than one-third of all US localities that had enacted restrictions on the sale of flavored tobacco products were in California.[1] In December 2022, California also became the second state following Massachusetts to prohibit the sale of most flavored tobacco products, including flavored electronic nicotine delivery systems (ENDS) and menthol cigarettes. Further, California is home to the first two cities in the US to prohibit the sale of any tobacco products under so-called no-sales of tobacco policies: Beverly Hills and Manhattan Beach.

The primary goals of imposing local flavor sales restrictions are twofold: first, to prevent tobacco initiation among youths and young adults, and second, to address the disproportionate use of menthol cigarettes among African American/Black communities, which contributes to racial disparities in smoking rates.[2-5] Flavored tobacco products, such as those mimicking fruits, candies, and menthol, have been aggressively marketed as less harmful alternatives to traditional cigarettes, and are particularly attractive to adolescents.[2, 3] By limiting access to these products, Californian communities have aimed to reduce youth smoking initiation, a crucial step in long-term tobacco prevention and control. While several studies have evaluated the effects of flavor restrictions and menthol bans on single states of jurisdictions and one national study, there have not been any comprehensive studies evaluating the impacts of local sales restrictions in California using causal inference methodologies.[6-8] This gap in evidence comes at a critical time as California lawmakers contemplate how to improve the effectiveness of the California statewide restriction on flavored tobacco products known as Senate Bill (SB) 793.

SB 793, a significant legislative measure, went into effect on December 21, 2022, following a voter referendum that upheld its enactment two years prior. The law's intended goals are to reduce youth initiation and lessen health disparities, particularly among African American/Black communities, exacerbated by flavored tobacco products.[9] In many cases, the statewide flavored tobacco sales restriction strengthened existing local sales laws by prohibiting the sale of menthol combustible products.[10] The long-term impacts of the law are unknown, although it has faced a number of well documented challenges, including legal challenges, the lack of a designated enforcement agency when the law first went into effect, and the introduction of new products and product descriptors designed to circumvent the sales restrictions.[6, 11-15]

Laws that restrict the sale of all tobacco products are a recent policy innovation in the US. On January 1, 2021, Beverly Hills and Manhattan Beach became the first cities in the US to put into effect local no-sales of tobacco policies. The policies followed proposals to end the commercial retail sale of tobacco products in pursuit of substantially reducing tobacco prevalence.[16] While the approach has been shown to have a degree of popular

support,[17] the policy's effectiveness has not been established.[16] Studies of Beverly Hills and Manhattan Beach have documented that affected retailers have generally opposed the law and have expressed concern about the anticipated impacts on their business.[18, 19] Despite the opposition, compliance in the two cities has been shown to be relatively high based on secret shoppers.[20] Yet, the economic impacts of the policies on policy-affected retailers and on policy evasion through cross-border shopping are not yet known.

B. Study objectives and overview

Because local and state policies that restrict the sale of tobacco products are an important component in the overall state effort to reduce tobacco use and the burden of tobacco-related disease, the California Department of Public Health (CDPH) is interested in tracking and evaluating the impacts of these policies on key stakeholders and the local and state economy. Policymakers and program administrators are also interested in understanding whether different program parameters and specific policies may modify the effectiveness of these policies, because this information can help the state and local government to develop or refine their tobacco control strategy.

To achieve these objectives, the CDPH needs rigorous evidence on the impacts of tobacco sales restriction policies. The present study included a multi-component evaluation of local and state sales restrictions on tobacco products. The first two components entailed an evaluation of the effects of local sales restrictions on flavored tobacco products and local no-sales of tobacco laws in California, analyzing changes in market dynamics in the lead-up to the statewide flavored tobacco sales restriction policy, from April 2018 to December 2022. The research focuses on the resultant shifts in sales of both policy-affected flavored tobacco products and potential substitute products, as well as broader economic effects such as cross-border shopping and changes in the sale of non-tobacco products in policy-affected areas.

The local policy evaluations aim to assess the effectiveness of local policies using a robust analytical framework that leverages a unique data set of retail sales from a wide array of retail establishments across California and employs advanced econometric models, including difference-in-differences analyses, to accurately quantify the impacts of these policies. Our analysis covers five critical areas to understand the broader impact of the local policies on consumer behavior and market shifts. These include: 1) the immediate effect on unit sales of flavored tobacco products directly targeted by the sales restrictions, 2) the potential increase in sales of substitute tobacco products not covered by the sales restrictions, 3) changes in the purchasing patterns of smoking cessation products, namely nicotine replacement therapy (NRT) products, 4) the propensity for cross-border shopping in neighboring areas without such sales restriction policies, and 5) the overall effect on dollar sales of non-tobacco products within the local economies.

The third component of the study extended the first two by modeling the projected change in tobacco tax revenues and related program funding as a result of the local sales restrictions. The analysis further compared these projected changes to actual experience following the first year of SB 793. The approach was strengthened by combining real-time estimates with projections and retail scanner data on tobacco sales with official reports of tobacco tax revenues.

The final component of the project involved key informant interviews with tobacco retailers from four Northern California communities regarding the roll-out and economic impacts of SB 793 for their business and customers. The in-depth interviews focused on tobacco specialty shops, which are presumed to be among the most adversely affected by the state law. The findings provided a snapshot of the challenges and opportunities that sales restrictions pose for a disproportionately impacted stakeholder.

By quantifying the direct and indirect effects of the local and state sales restriction policies, this study fills a crucial gap in the literature and offers valuable insights for policymakers seeking to enhance the efficacy of tobacco prevention and control measures. The findings not only contribute to the understanding of how local and state regulations affect tobacco sales patterns but also help in assessing the broader economic impacts, aiding in the formulation of more comprehensive public health policies that can effectively reduce tobacco use among vulnerable populations.

C. Validity of the evaluation approach

The validity of the evaluation approach for this comprehensive study on the impact of tobacco sales restrictions in California is anchored in a multi-faceted methodological framework, integrating diverse data sources and analytical techniques tailored to the unique aspects of each of the four project components.

The first component of the study, evaluating local flavored tobacco sales restrictions, and the second, assessing local no-sales policies in select California cities, both utilize NielsenIQ's retail scanner data. This custom data set included granular, store-level sales data, providing a robust basis for detailed trend analysis across various product categories and geographical areas. By applying a difference-in-differences regression framework alongside synthetic difference-in-differences (SDID) methods, these analyses effectively isolate the impact of local tobacco sales restriction policies from other concurrent changes, such as statewide legislation or economic fluctuations. These advanced econometric techniques ensure precise estimation of policy impacts by comparing treated and control groups while accounting for potential confounders that could skew results, thereby enhancing the credibility of findings.

The third component extends the evaluation to model the fiscal impacts of local flavored tobacco sales restrictions and no-sales policies on state tobacco tax revenues and related program funding. This analysis employs counterfactual scenarios to project and compare potential revenue outcomes with and without policies in effect. By synthesizing sales data with administrative data, this economic modeling approach provides an assessment of the fiscal implications of tobacco sales restriction policies.

Finally, the fourth component comprises key informant interviews with tobacco retailers to gauge their perspectives on the economic impacts of a statewide flavored tobacco sales restriction. This qualitative approach complements the quantitative analyses by capturing the experiential and practical challenges faced by businesses due to the policy change. By employing thematic content analysis of interview transcripts, this component enriches the overall study with nuanced perspectives on the real-world effects of tobacco legislation on local economies, thereby offering a holistic view of policy impacts.

Together, these methodological strategies, tailored to the specific needs of each analysis component, reinforce the overall validity of the evaluation approach. By integrating detailed retail data, rigorous statistical methods, fiscal projections, and qualitative insights, the study provides a well-rounded and robust assessment of California's tobacco sales restriction policies, ensuring that conclusions drawn are both reliable and broadly informative.

D. Plan for the report

The purpose of this report is to summarize the four components of the project, which are fully described in two separate reports, one manuscript under review, and one manuscript in progress.[21-24] The remainder of this report is as follows. Chapter II of this report introduces data sources and methods of integrating and analyzing the data. Chapter III describes findings from each of the four components of the project. The final chapter summarizes the main findings, discusses the implications for the state, and provides recommendations for the CDPH's California Tobacco Prevention Program (CTPP) and other stakeholders.

2. METHODS

A. Data sources

The evaluations of local flavored tobacco sales restrictions and local no-sales of tobacco policies used an integrated database comprised of store-level data and geocoded policy and demographic data by ZIP code and city.

The store-level data were drawn from a retail scanner data set from NielsenIQ. Nielsen retail scanner data consist of weekly pricing, volume, and store merchandising conditions generated by participating retail store point-of-sale systems in US markets. Nationwide, Nielsen collects data from approximately 35,000 participating grocery, drug, mass merchandising, and other stores. We licensed a custom store-level data set for all available stores located in California. Overall, the custom data covered more than 3,000 grocery stores, convenience stores (including gas stations), and drug stores from 528 California cities. Included sales constituted approximately 16% of California cigarette retail sales, as the use of store-level data was limited to retailers that had granted NielsenIQ prior approval to share the more granular data. Our data set had comparable coverage in California to the NielsenIQ Retail Scanner Data available via the University of Chicago's Kilts Center, commonly used in tobacco policy evaluations,[25-27] in terms of number of tobacco retailers and total cigarette sales. The custom data contained quad-weekly (i.e., monthly) item-level data on tobacco and NRT products sold from May 2018 through December 2022. The data provided the exact address of stores to identify those located in border areas. Data were provided at the individual product level based on unique universal product code (UPC) and contained quad-weekly, hereafter "monthly," store-level unit and dollar sales of each product purchased. Nielsen also provided total sales for each store for 12 non-tobacco product departments: baby care, bakery, dairy, deli, frozen, general merchandise, grocery, health and beauty care, household care, meat, produce, and seafood. We used the department totals to assess whether the local policies affected non-tobacco sales at policy-exposed retailers.

Policy exposure data were drawn from the Policy Evaluation Tracking System (PETS) database, maintained by the American Nonsmokers' Rights Foundation.[28] Demographic data by ZIP code and city were drawn from the Decennial Census and the American Community Survey, both maintained by the US Census Bureau.

B. Data analyses

i. Analysis of local flavor sales restrictions

Measures

Tobacco and nicotine-containing products were classified into five categories: 1) cigarettes, 2) cigars, including big cigars, little cigars, and cigarillos, 3) smokeless tobacco, 4) electronic nicotine delivery systems (ENDS), including e-cigarettes and other nicotine vaping products, and 5) nicotine replacement therapy (NRT) products, such as nicotine gum. Each UPC was further classified as a flavored or unflavored product based on product information provided by Nielsen.

Local flavored tobacco sales restrictions in California were obtained from the PETS database. We used this information to identify policy effective dates and classify policies into four categories: 1) any policy that restricted flavored tobacco products, regardless of tobacco product type, 2) policies restricting ENDS only, 3) policies restricting ENDS, combustibles (including cigarettes and cigars), and smokeless tobacco, and 4) policies restricting menthol flavored tobacco products. For assessing cross-border shopping, we defined border areas as cities that were adjacent to a city with a local sales restriction policy of interest.

The main analyses focused on unit sales of all tobacco products sold, as well as unit sales of flavored products and unflavored products, unit sales of substitute tobacco product categories, and unit sales of NRT products. In investigating sales of non-tobacco outcomes, total non-tobacco dollar sales were calculated as the sum of the above non-tobacco product categories.

Statistical analyses

We used a difference-in-differences regression framework to compare outcomes in cities with a local flavored tobacco sales restriction policy compared with outcomes in cities without one. The model included month-year fixed effects that account for secular trends (period-specific events) that are common to all cities (e.g., the COVID-19 pandemic and state tobacco taxes) and city fixed effects that account for all city characteristics that do not vary during the study period. Thus, a main threat to validity of this approach would be other factors (e.g., other tobacco policies) that vary over time differentially among cities in the treated group. Standard errors were clustered at the city level to account for correlated outcomes within each city over time. For estimates of cross-border shopping, the policy exposure was modified to consist of cities that border a city with a local flavored sales restriction policy.

ii. Analysis of local no-sales of tobacco restrictions

Overview and measures

We assessed the effects of the no-sales of tobacco policies put into effect in Beverly Hills and Manhattan Beach on: 1) unit sales of tobacco products, overall and by tobacco category, 2) unit sales of NRT products, 3) dollar sales of non-tobacco products, and 4) cross-border shopping of tobacco and non-tobacco products. Sales data were aggregated quarterly for each geographic unit of analysis. To increase the comparability of outcomes in the treated cities with those in the donor pool of control cities, we calculated the tobacco and NRT product outcomes as the store average within each city or border area. To assess cross-border shopping, border areas were creating using the ZIP codes contiguous with Beverly Hills and Manhattan Beach. To assess the sale of non-tobacco products as an indicator of the broader policy impacts on retailers, we calculated the sum of sales across all non-tobacco store departments.

We used American Community Survey five-year estimates from 2017–2022 for population size, median income, and racial and ethnic composition.

Statistical analyses

The analysis uses the recently developed synthetic difference-in-differences (SDID) estimation approach.[29] SDID brings together the strengths of difference-in-differences and synthetic control methods. Similar to synthetic control analysis, SDID is a data-driven approach that applies weights to control units in order to construct a weighted average of all potential control (non-treated) localities that best approximates the treated area on both the pre-treatment outcome and a set of prognostic factors.[30] SDID thereby constructs a counterfactual outcome for what would have happened to the treated area in the absence of treatment. SDID adds time weights that align pre-exposure trends in the outcome of unexposed units with those for exposed units. SDID has been shown to have excellent performance compared with synthetic control and alternative approaches.[29] Our SDID model includes fixed effects (i.e., indicators) for geographic area (city or border ZIP code) and year-month, thereby adjusting for all time-invariant city characteristics and secular trends. A permutation-based approach was used to generate confidence intervals around estimates.[29] Under this approach, placebo estimates were generated for randomly sampled cities in the donor pool of control cities as if that sampled city had been subject to a no-sales policy.

iii. Analysis of tobacco tax revenue and related program funding

We extended our analyses of local flavored tobacco sales restrictions and no-sales of tobacco policies to assess the fiscal impacts. Specifically, we projected the estimated policy impacts from the first two study components on state tobacco tax revenues from all tobacco excise taxes and program funding from Proposition (Prop) 99 and 56.

For each policy type, we consider two different counterfactual scenarios:

1) Lost revenue from the adoption of the sales restrictions by selected California localities (i.e., if the treated cities had not been treated)
2) Anticipated lost revenue if all California cities had adopted the local sales restrictions (i.e., if untreated cities had been treated)

For the flavored tobacco policy analysis, we then compared our projections of change in revenue under scenario #2 to the actual change in revenue during the first year following SB 793.

For the program funding calculations, we disaggregated the estimated impacts by different program funds (Appendix A).

iv. Key informant interviews about the state flavor restrictions

Sampling frame

We conducted in-person key informant interviews with retailers from four Northern California cities to report on their perspectives regarding the economic impacts of SB 793 on their business. Given hypotheses about the potential effects of flavored tobacco sales restrictions on racial disparities in tobacco use, particularly given the disproportionate use of menthol products among Black communities, we first identified Northern California jurisdictions without local flavor sales restrictions, and then chose those with the largest number of Black residents per the 2021 American Community Survey data. We included jurisdictions without pre-existing flavor sales restrictions, so that retailers could speak directly to their experiences with the statewide restrictions (Elk Grove, Modesto, and

Stockton). Each of these cities are in central California, about a three-hour drive from Reno, Nevada. We also included a fourth jurisdiction, San Jose as a reference community with a pre-existing flavored tobacco sales restriction effective since June 2022 and many Black residents. Using the California Department of Tax and Fee Administration's publicly available records of licensed tobacco retailers, we created a list of potential venues in each neighborhood, supplemented through Google and Yelp searches prior to in-person visits. We included a variety of tobacco retailers in our search (e.g., gas stations, pharmacies, vape and smoke shops, and grocery stores). We aimed to conduct a minimum of five interviews per jurisdiction.

Data collection

Eligibility criteria included being the owner or manager of a business that sold tobacco/nicotine products and speaking English or Spanish. Interviews occurred July to September 2023, approximately six to eight months after California's law went into effect. Interviewers were open to interviewing retailers at any store selling tobacco products but focused on tobacco specialty shops since we hypothesized that they would be disproportionately impacted by SB 793; tobacco specialty shops were also more likely to agree to an interview.

Interviews occurred at each store and were digitally recorded unless the interviewee did not consent to audio-recording; in these seven instances, one interviewer took notes while the other asked questions. The interview guide included questions about their implementation of SB 793, how retailers learned of it, and their experiences since the law went into effect, including shifts in what they sold, customer responses, and experiences with enforcement. The interviews took 10-15 minutes. This study was exempted by the institutional review board at the University of California San Francisco (IRB number 23-39282).

Analysis

Interviews were transcribed verbatim and uploaded into Dedoose Software for analysis. We used a thematic content analysis approach to code the interviews.[31, 32] The study team developed an initial codebook based on the interview guide and existing literature. To finalize the codebook, three team members independently coded 20% of the transcripts and met to compare them line-by-line. All transcripts were reviewed by two coders. There were high levels of agreement regarding code definitions and application within the transcripts; the few discrepancies were resolved during team meetings.

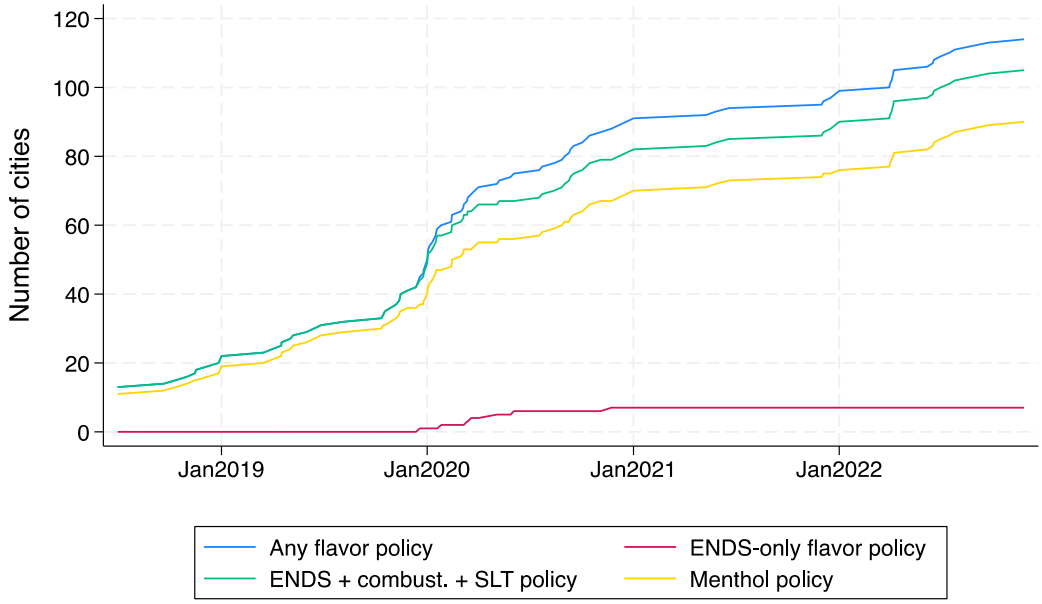
3. RESULTS

A. Results for analysis of local flavor sales policies

i. Summary statistics

By November 2022, 120 cities in California had local flavored tobacco sales restriction policies in effect. There was a steady increase in these local policies over time (Figure 1). By November 2022, 114 cities in California had put into effect a flavored tobacco sales restriction, seven of which restricted ENDS only, 105 of which restricted ENDS, combustibles, and smokeless tobacco (SLT), and 90 of which restricted menthol products. Thus, most cities with a flavor policy regulated ENDS, combustibles, and SLT products, including menthol products. Only seven policies focused on flavored ENDS only.

Figure 1. Cumulative number of cities with local flavor policies in effect, 2018-2022



Note: Data provided by PETS (https://pets.tcspartners.org/).

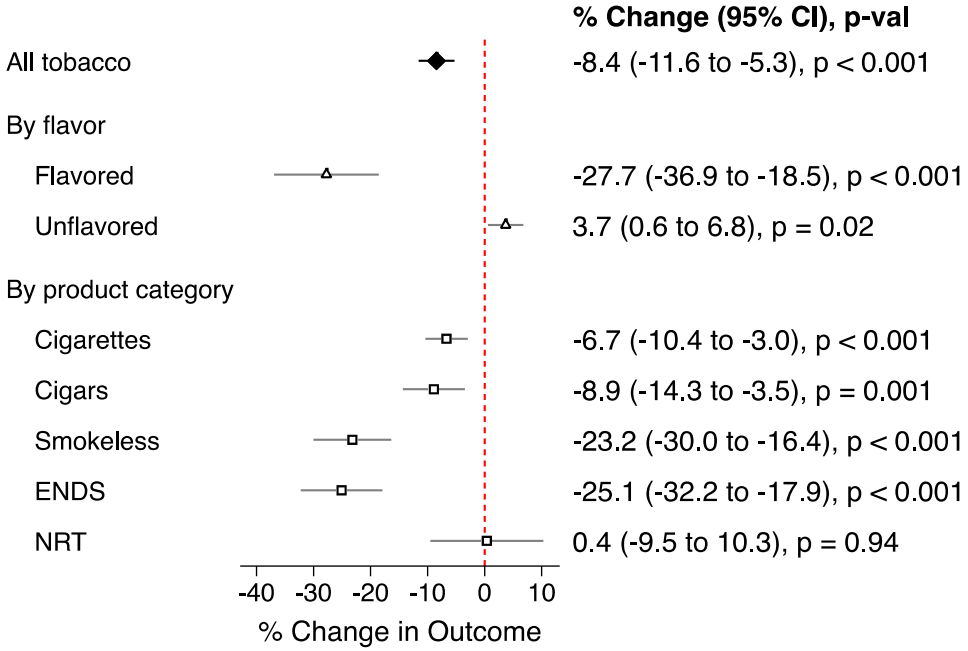
Appendix Table 1 presents summary statistics on the number of UPCs (individual products), stores, and cities in the control group and treated group. The analysis included 5,077 unique tobacco or NRT products, drawn from 3,248 stores located in 528 cities. The treated group was comprised of 110 cities. Convenience stores were the most common store type, followed by grocery stores, and then drug stores (Appendix Figure 1).

ii. Policy effects on tobacco and NRT product sales

Figure 2 shows the effects of local flavored tobacco sales restrictions on the sale of tobacco and NRT products from the main analyses. Any local flavor policy going into effect reduced the sale of all tobacco products by a statistically significant 8.4% on average. There was also a significant 27.7% decline in flavored tobacco products and a smaller 3.7% significant increase in unflavored tobacco products. Thus, some consumers switched from flavored to unflavored products following policies going into effect,

although this was outstripped by decrease sales of flavored products by roughly 2,500 units per month, on average. Following policies going into effect, sales significantly decreased across all tobacco product categories, including by 6.7% for cigarettes, 8.9% for cigars, 23.2% for SLT, and 25.1% for ENDS. NRT product sales increased by a non-significant 0.4%, implying that the local flavor policies did not lead large numbers of consumers to seek out smoking cessation aids.

Figure 2. Local flavor policy effect on unit sales of tobacco and NRT products



Note: This figure shows the effects of any local flavor policy going into effect on tobacco and NRT product sales. Estimates are expressed as a percent change compared with pre-policy sales. Full results in Appendix Table 2.

When estimating the same outcomes for more comprehensive local policies and policies that include restrictions on menthol products, the results are very similar though the magnitudes are larger for more comprehensive policies, such that the sale of all tobacco products declined by a statistically significant 9.0% (Appendix Table 4). The similarity is not surprising because of the near-complete overlap between cities that have any flavor policy versus cities that have a more comprehensive or a menthol policy (Figure 1). ENDS-only policies, which constitute a potentially nonrepresentative group of seven cities only, experienced substantial, non-significant decreases in the sale of ENDS products of 43.6% (Appendix Table 3).

In Table 1, we disaggregate the estimates for menthol policies by flavored and unflavored products across different product categories. We find that sales of menthol cigarettes significantly decreased by 30.5% and sales of non-menthol cigarettes increased by a non-significant 1.8%, leading to the overall significant decline in cigarette sales of 6.7%.

Table 1. Local menthol policy effect on unit sales of flavored and unflavored tobacco products across different product categories

	Cigarettes		Smokeless tobacco			ENDS		
	Menthol	Unflavored	Menthol	Other flavored	Unflavored	Menthol	Other flavored	Unflavored
ATT	-2187.3***	311.1	-31.9*	165.5***	-816.8***	174.7**	3.5	-58.0
	(471.1)	(206.3)	(16.3)	(40.9)	(69.0)	(22.3)	(32.8)	(40.1)
No. obs.	29,927	29,987	7,390	26,003	25,083	24,691	26,051	24,233
ATT as % change	-30.5 [-43.3, -17.6]	1.8 [-0.5, 4.2]	-205.0 [-410.7, 0.6]	36.4 [18.8, 54.0]	-41.0 [-47.8, -34.2]	-66.6 [-83.2, -49.9]	0.9 [-16.0, 17.9]	-17.3 [-40.7, 6.1]

Note: This table shows estimates from the main analyses. Robust standard errors, clustered at city level, are shown in parentheses. ATT = average treatment effect on the treated. Percent changes are calculated relative to the pre-policy mean in the treated group. Significance: * p<0.10 ** p<0.05 *** p<0.01

iii. Policy effects on cross-border shopping

A key concern of local flavor policies is that some consumers will seek to evade the policy by shopping for tobacco products in a nearby jurisdiction. We find that overall tobacco sales increased by a non-significant 1.0% in border areas following any flavor policy going into effect (Table 2), indicating no increase in tobacco sales in border areas. We also do not find significant increases in sales for flavored or unflavored products nor for any of the tobacco or NRT product categories. Thus, we do not find evidence that individuals are shopping in nearby border areas in any large number.

Table 2. Local flavor policy effect on cross-border shopping for tobacco products

	Among targeted product categories			By product category				
	All	Flavored	Unflavored	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	181.0	359.6	-178.5	-103.8	134.9	146.7*	11.9	3.6
	(409.2)	(219.6)	(244.9)	(297.2)	(126.9)	(86.2)	(25.0)	(11.6)
No. obs.	25,150	25,130	25,150	25,144	23,942	22,004	21,407	4,759
Mean DV	18,624.9	7,302.0	11,325.3	13,021.8	3,521.8	1,780.2	601.1	61.0
ATT, % change	1.0	4.9	-1.6	-0.8	3.8	8.2	2.0	5.9
	[-3.3, 5.3]	[-1.0, 10.8]	[-5.8, 2.7]	[-5.3, 3.7]	[-3.2, 10.9]	[-1.2, 17.7]	[-6.2, 10.1]	[-31.6, 43.3]

Note: This table shows the effect for cities bordering a city with any local flavor policy (n=100), compared with non-border cities without a local flavor policy (n=320). Targeted products refer to product categories for which flavored products were regulated by the policy. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data are collapsed to the city-by-month level. The treated group is composed of never-treated cities bordering a city with a flavor policy, and the control group is composed of never-treated cities not bordering a city with a flavor policy. Cities with a flavor policy are dropped from the analysis. Robust standard errors, clustered at city level, are shown in parentheses below estimates. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT, % change = the ATT expressed as a percent change relative to the mean DV, with its 95% CI below. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01. Full results are in Appendix Table 6.

iv. Policy effects on the sale of non-tobacco products

Cities with any flavor policy had a small, not statistically significant increase in total sales of non-tobacco products of 1.0% on average ($46,214 per month) following a policy going into effect (Table 3). This suggests that stores did not experience a detectable decline in the sale of non-tobacco products due to fewer transactions with tobacco purchases. However, the uncertainty of our estimates imply that we cannot rule out small declines in non-tobacco sales. We observe similar patterns following ENDS-only policies going into effect, ENDS plus combustibles plus SLT policies, and menthol policies.

Table 3. Local flavor policy effect on dollar sales of non-tobacco products, by policy type

	Any flavor policy	ENDS flavor policy	ENDS + combustibles + SLT flavor policy	Menthol policy
ATT	46,214	26,511	22,086	53,348
	(79,152)	(154,791)	(82,302)	(103,643)
No. observations	32,133	25,878	31,584	30,608
ATT as % change	1.0%	1.2%	0.4%	1.0%
	[-2.2, 4.2]	[-12.3, 14.6]	[-2.8, 3.7]	[-2.8, 4.7]

Note: This table shows change in total dollar sales of non-tobacco products. Percent changes are calculated relative to the pre-policy mean in the treated group. Significance: * p<0.10 ** p<0.05 *** p<0.01. Full results are in Appendix Table 7.

B. Results for analysis of local no-sales of tobacco policies

i. Descriptive statistics

Appendix Table 12 shows the number of UPCs, stores, and cities in the treated cities and the donor pool of control cities. In total, the data contain two stores in Beverly Hills (one grocery store and one pharmacy) and six stores in Manhattan Beach (one grocery store and five convenience stores). The donor pool contained 481 potential control cities. The Beverly Hills border area consisted of 15 stores (two grocery stores, three drug stores, and ten convenience stores), and the Manhattan Beach border area consisted of 15 stores (three grocery stores, two drug stores, ten convenience stores).

There were large differences in mean tobacco sales and demographic characteristics between the treated cities and the donor pool of control cities in these unadjusted data (Appendix Table 12). This provides a rationale for forgoing the entire pool of comparison cities as a control group and instead turning to a synthetic control-like approach that can provide a better match to the treated groups, which are themselves somewhat different from each other.

ii. Policy effects on tobacco and NRT product sales

The SDID procedure constructs a weighted average of potential control cities to match each treated city. The 20 donor pool cities that received the most weight for each treated city are listed in Appendix Table 13. No single city contributed more than five percent to the synthetic control for Beverly Hills or more than 15% for Manhattan Beach. A total of 151

cities contributed to the synthetic control for Beverly Hills and 23 to the synthetic control for Manhattan Beach for the analysis of unit sales of all tobacco products.

Figure 3 shows the outcome trends for all tobacco products between each treated city and its synthetic control based on the SDID analysis. The SDID procedure produced a synthetic control with a relatively close match to the outcome trends for each treated city.

Beverly Hills and Manhattan Beach each experienced large reductions in tobacco sales in the sample of convenience, grocery, and drug stores. Sales started to decline just prior to the policy in Beverly Hills. Tobacco sales in the Beverly Hills stores ceased within the first three months after its policy took effect. Total tobacco sales in the Manhattan Beach stores decreased to <1% of pre-ban sales by the end of 2021; our study sample included one convenience store that had received a temporary hardship exemption and continued to sell a small number of tobacco units for six months post-policy. With the exception of the exempt store, tobacco sales in the other Manhattan Beach stores reached zero by the end of 2021.

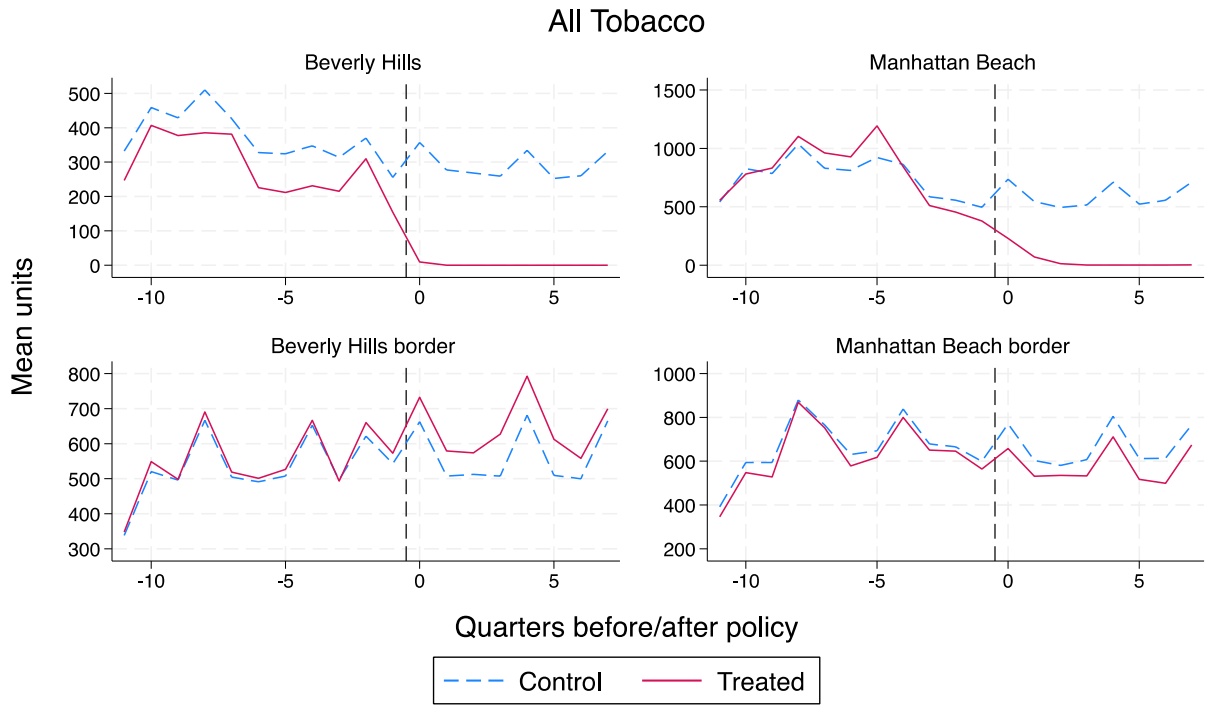
In Table 4, we quantify the policy's effect in Beverly Hills and Manhattan Beach and their border areas following the effective policy date based on the SDID analysis. In Beverly Hills, all tobacco sales significantly decreased 66.7% following the ban going into effect, compared with the trend in its synthetic control. In Manhattan Beach, all tobacco sales significantly decreased 65.2%, following the no-sales policy going into effect, compared with the trend in its synthetic control. The event studies show that a steep decline in sales began immediately after the policy went into effect and persisted throughout the end of the study period (Figure 3).

After the tobacco sales bans, NRT product sales significantly decreased in the Beverly Hills stores (-5.1%), and did not significantly change in the Manhattan Beach stores (21.5%). An important caveat is that the Manhattan Beach store sample did not include any drug stores, where NRT products are commonly purchased.

iii. Policy effects on cross-border shopping

Sales of all tobacco products in sampled stores in the area surrounding Beverly Hills increased, on average, by a non-statistically significant 9.5%; this implies sales did not significantly shift to the sampled convenience, grocery, and drug stores in the Beverly Hills border area (Figure 3). Sales of all tobacco products in the sampled stores in the border area surrounding Manhattan Beach decreased by a non-statistically significant 8.7%, compared with its counterfactual trend following implementation of the Manhattan Beach policy. The average treatment effect estimates confirm these descriptive trends (Table 4). Individual tobacco product categories in the Beverly Hills and Manhattan Beach border stores also showed non-statistically significant increases for all product categories.

Figure 3. Trends in unit sales of all tobacco products between treated and border areas with their synthetic control before and after local no-sales policy's effective date



Note: This figure shows trends over time in mean unit sales for the treated or border area and its synthetic control. Estimates are derived from synthetic difference-in-differences models that include geographic and month-year fixed effects.

Table 4. Effect of local no-sales of tobacco policies on quarterly unit sales of tobacco products in treated and bordering areas

	Beverly Hills	Manhattan Beach	Beverly Hills border	Manhattan Beach border
ATT	-190.7**	-506.1***	52.0	-54.5
	(-358.4, -23.1)	(-673.7, -338.5)	(-115.5, 219.6)	(-222.0, 113.1)
No. obs.	9,025	9,025	9,025	9,025
ATT as % change	-66.7	-65.2	9.5	-8.7
	(-125.4, -8.1)	(-86.8, -43.6)	(-21.1, 40.1)	(-35.4, 18.0)

Note: This table shows estimates from synthetic difference-in-differences models of the change in mean units sold per store of all tobacco products. Data were analyzed at the city-quarter level and included a sample of convenience, grocery, and drug stores. 95% confidence intervals are provided in parentheses. ATT = average treatment effect on the treated. The percent change is calculated relative to the baseline mean dependent variable. Significance: * p<0.10 ** p<0.05 *** p<0.01. Full results are in Appendix Tables 14-17.

NRT sales were significantly higher in the Beverly Hills border area by 3.9% following its policy, and non-significantly lower in the Manhattan Beach border area by 1.1% following its policy (Table 5).

Table 5. Effect of local no-sales of tobacco policies on quarterly unit sales of NRT products in treated and bordering areas

	Beverly Hills	Manhattan Beach	Beverly Hills border	Manhattan Beach border
ATT	-7.7**	-0.5	2.0	-0.3
	(-14.3, -1.0)	(-7.2, 6.1)	(-4.6, 8.7)	(-6.9, 6.4)
No. obs.	8,702	8,702	8,702	8,702
ATT as % change	-5.1	-21.5	3.9	-1.1
	(-9.5, -0.7)	(-286.3, 243.3)	(-8.9, 16.7)	(-30.5, 28.3)

Note: This table shows estimates from synthetic difference-in-differences models of the change in mean units sold per store of NRT products. Data were analyzed at the city-quarter level and included a sample of convenience, grocery, and drug stores. 95% confidence intervals are provided in parentheses. ATT = average treatment effect on the treated. The percent change is calculated relative to the baseline mean dependent variable. Significance: * p<0.10 ** p<0.05 *** p<0.01. Full results are in Appendix Tables 14-17.

iv. Policy effects on non-tobacco sales

We investigated the effect of the local no-sales policies on dollar sales of non-tobacco products sold at sampled convenience, grocery, and drug stores within treated cities and their border areas (Table 6). In Beverly Hills, non-tobacco purchases increased by a non-significant 6.2% following its policy going into effect. There is no evidence that the no-sales policy negatively impacted retailers' revenues from non-tobacco products there. A small number of tobacco consumers may have shifted their purchases away from tobacco products and toward other types of products. There is also no significant corresponding change observed in the Beverly Hills border area.

Manhattan Beach stores experienced a not statistically significant decline in non-tobacco sales of 14.0%, with a wide 95% confidence interval that places the percent change anywhere from a decline of -100.0% to a gain of 72.0%. Correspondingly, the Manhattan Beach border area had a non-significant 5.9% decrease in sales of non-tobacco products, suggesting that consumers did not shift their non-tobacco purchases from Manhattan Beach to the border area.

Table 6. Effect of local no-sales of tobacco policies on quarterly dollar sales, in thousands, of non-tobacco products in treated and bordering areas

	Beverly Hills	Manhattan Beach	Beverly Hills border	Manhattan Beach border
ATT	192	-231	-450	-637
	(-1229, 1614)	(-1653, 1191)	(-1871, 972)	(-2058, 785)
No. obs.	9,766	9,766	9,766	9,766
ATT as % change	6.2	-14.0	-3.0	-5.9
	(-39.4, 51.7)	(-100.0, 72.0)	(-12.5, 6.5)	(-19.2, 7.3)

Note: This table shows estimates from synthetic difference-in-differences models of the change in total

dollar sales of non-tobacco products. Data were analyzed at the city-quarter level and included a sample of convenience, grocery, and drug stores. 95% confidence intervals are provided in parentheses. ATT = average treatment effect on the treated. The percent change is calculated relative to the baseline mean dependent variable. Significance: * p<0.10 ** p<0.05 *** p<0.01.

C. Results from analysis of tobacco tax revenues and related program funding

Under a counterfactual scenario in which California cities with a local flavored tobacco sales restriction had never implemented the policy, we estimate that state tobacco tax revenues would have been $50.4 million higher in 2022 (Appendix Table 18). Funding for Prop 99 programs would have increased about $4.4 million in 2022 (Appendix Table 21), and funding for Prop 56 programs would have increased about $33.3 million in 2022 (Appendix Table 22).

Under a scenario in which all California cities without a flavored tobacco sales restriction had such a policy, we estimate that state tobacco tax revenues would have decreased by $139.1 million in 2022 (Appendix Table 19). However, actual tax revenue declines during the first year after SB 793 were roughly twice as large as these projections indicate, suggesting that sales declined more rapidly than anticipated based on local experience (Appendix Table 20). Funding for Prop 99 programs would decrease about $12.1 million in 2022 (Appendix Table 21), and funding for Prop 56 programs would decrease about $92.4 million in 2022 (Appendix Table 22).

Under a counterfactual scenario in which Beverly Hills and Manhattan Beach had never implemented a no-sales of tobacco policy, we estimate that state tobacco tax revenues would have been $2.3 million higher in 2022 (Appendix Table 23). Funding for Prop 99 programs would increase about $202,000 in 2022 (Appendix Table 25), and funding for Prop 56 programs would increase about $1.1 million in 2022 (Appendix Table 26).

Under a scenario in which all California cities implemented a no-sales of tobacco policy, we estimate that state tobacco tax revenues would have decreased by $1.74 billion in 2022 (Appendix Table 24). Funding for Prop 99 programs would decrease about $151.7 million in 2022 (Appendix Table 25), and funding for Prop 56 programs would decrease about $1.19 billion in 2022 (Appendix Table 26).

D. Results from retailer interviews about the state flavored tobacco sales restriction policy

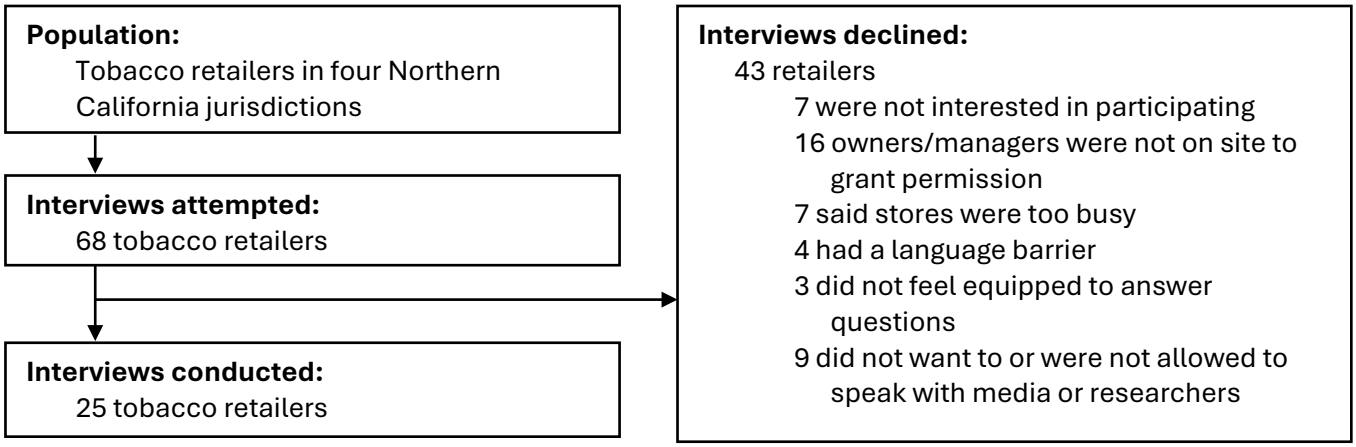
Figure 4 shows the number of eligible retailers approached and the number who participated. The higher rates of refusals among non-tobacco specialty shops were due primarily to the manager not being present and individuals feeling unable to contribute due to minimal impacts of the sales restrictions on their store.

Three main themes emerged about retailers' experience with SB 793: 1) confusion about how to comply, 2) its impact on business, and 3) compliance and enforcement.

Confusion about how to comply. Interviewees reported frequent frustrations with rollout of the state law; nearly all would have liked more guidance from government

agencies before and after the effective date. They described a lack of clarity regarding which products could still be sold and what to do with (now unsellable) flavored products in stock. However, retailers in San Jose, where local flavor restrictions were in place prior to the state law, experienced less uncertainty following statewide restrictions.

Figure 4. Flowchart of completed key informant interviews



The perceived lack of consistent and clear messaging about when and whether the law would go into effect—and around which products were restricted under the law—meant that retailers frequently had a cursory understanding of the law's implications for their store. Some retailers contacted government agencies by phone or email to gather more details about which products they could sell, often receiving no response. This led some retailers to ask tobacco distributors about which products they were allowed to sell, and distributors often gave conflicting or inaccurate information. Retailers believed that felt an online list of allowable products would be helpful.

Many retailers had large unsellable quantities of flavored products when the law went into effect. Some wished that the State had implemented a 'buy back' program for the unsellable products to ease the economic strain on their business.

Impact on business. Interviewees, particularly from tobacco specialty shops, reported an estimated decline in sales revenue after SB 793 going into effect ranging from 15-70%, though few specified the comparison period (e.g., the week or month pre-policy). While interviewees had not laid off staff, some reported decreasing staff working hours due to the lost revenue and reduced foot traffic. Some interviewees said that other local tobacco retailers were planning to close or sell their business.

Retailers adopted several strategies to increase revenue after the law. Many introduced new smoking equipment, such as glass pipes and electronic vaping devices or batteries, and some expanded into clothing and novelty items. Many participants approached other tobacco retailers or manufacturers about which new products to introduce. New product lines included ones prohibited under SB 793 but presumed to circumvent the law, such as OCB Flavor Cards and "drip tips" that convert non-flavored e-liquid into flavored e-liquid.

Nearly all participants shared that customers were displeased and frustrated by the state law. Some customers did not know about the law or that it was statewide until

retailers notified them. Some retailers believed that customers would circumvent the law by cross-border shopping and felt a national ban would be more effective. Others felt that the new law was more of a time tax for customers willing to drive to a neighboring state, adversely affecting California's tax base. Others described customers who switched from tobacco to cannabis.

Willingness to comply and enforcement. Based on retailers' reporting and interviewer observations, retailers mostly attempted to comply with SB 793. Most participants reported having removed items they understood to be prohibited from their shelves. Most retailers had not experienced or heard about any government enforcement initiatives related to SB 793. Enforcement of age-related point-of-sale tobacco regulations may have promoted retailer compliance.

4. DISCUSSION

A. Summary of major findings

This report details the evaluation of two distinct types of tobacco control policies in California: flavored tobacco sales restrictions and comprehensive no-sales of tobacco policies. The study provides detailed insights into their respective impacts on tobacco and non-tobacco product sales and the local economy as a whole. The mixed-method approach leveraged retail scanner data encompassing a wide array of retail establishments across California as well key informant interviews with tobacco retailers.

i. Local flavor policies

Local flavored tobacco sales restrictions that pre-dated SB 793 led to a significant reduction in the sales of all tobacco products by an average of 8.4%, with flavored tobacco products experiencing a substantial 27.7% decline. While there was a 3.7% statistically significant increase in unflavored tobacco product sales, suggesting some substitution by consumers, it was insufficient to offset the overall decrease in tobacco sales. The observed pattern of sales decline was substantial across different tobacco product categories, including cigarettes, cigars, SLT, and ENDS. In addition, the local flavor policies did not significantly change the sales of NRT products, indicating that these policies did not directly drive consumers towards increased use of smoking cessation products. It is, however, possible that consumers sought other ways to quit that did not show up in our data (e.g., counseling, prescription medications, mobile health programs).

Local flavor policies did not spur evasion through cross-border shopping, as the study found decreased tobacco product sales in border areas following implementation of the policies. In addition, the introduction of local flavor policies did not adversely affect the sales of non-tobacco products in these cities, with a slight, non-significant increase observed. These findings highlight the effectiveness of local flavor restrictions in reducing tobacco sales without displacing sales to nearby jurisdictions or negatively impacting other retail sales, providing strong support for such policies.

ii. Local no-sales of tobacco policies

The analysis of no-sales of tobacco policies in Beverly Hills and Manhattan Beach revealed a dramatic reduction in tobacco product sales in a sample of grocery, drug, and convenience stores. With the exception of one convenience store in Manhattan Beach that had a limited-time hardship exemption, tobacco product sales among sampled stores decreased to zero units within three months of the policies going into effect. This decrease aligns with the high compliance rates observed in these areas during a recent purchase attempt study.[20] These results reinforce the potential of tobacco sales bans as effective tools in achieving tobacco-free communities.

The negligible change in NRT product sales within the treated cities suggests that while tobacco sales declined, they were not mirrored by an increased adoption of smoking cessation products. This may indicate a gap in public health strategies to promote cessation products alongside restrictive sales policies. However, our data included only one drug store in a treated city, and the fit of the SDID model was particularly poor for NRT products, limiting what can be learned from this analysis.

The analysis of cross-border shopping effects revealed no significant change in tobacco sales in convenience, grocery, and drug stores in either border area. This suggests that any displacement of sales that occurred was limited in magnitude. However, the non-statistically significant increase in the Beverly Hills border area calls for further investigation into broader geographic impacts and the role of neighboring jurisdictions in supporting or undermining local tobacco control efforts. We would also anticipate that cross-border shopping would diminish in importance if no-sales of tobacco policies are adopted across larger geographic areas (e.g., clusters of contiguous cities or at the state level).

Concerning the economic impacts on retailers, our analysis shows that non-tobacco sales in our small sample of stores were not adversely affected by the no-sales policy. This is an important finding for policymakers, as it counters arguments against no-sales policies based on the potential negative economic impacts on local businesses. However, the non-statistically significant decrease in non-tobacco sales in the Manhattan Beach sample suggests a small geographical redistribution of consumer spending could have occurred, which may necessitate supportive measures for local businesses during the transition phase of such policies. These results also suggest the potential for local variations in the impacts of no-sales policies, which will be important to monitor.

iii. Tobacco tax revenue and program funding

We considered the fiscal impacts on tobacco excise tax revenues of two counterfactual scenarios, one scenario in which no California cities had implemented the local policy of interest—a local flavored tobacco sales restriction or a no-sales of tobacco policy—and one scenario in which all California cities had implemented the local policy of interest. We find that tax revenues would increase by $50.4 million if no cities implemented a local flavor policy and decrease revenues by $139.1 million if all cities had implemented them. We find that tax revenues would increase by $2.3 million if no cities implemented a local no-sales of tobacco policy and decrease revenues by $1.74 billion if all cities had implemented them.

Thus, we found that local and state policies have significant fiscal impacts on tobacco excise tax revenues and tax-supported program funding. Whereas local flavored tobacco restrictions are estimated to have had a modest fiscal impact, no-sales of tobacco policies would be expected to have a large fiscal impact if adopted by more localities. Provisions stipulate that some of the lost revenues going to Prop 99 and Prop 56 programs would be backfilled; however, a decline in revenue would be expected to result in a decline in percentage allocations for some programs over time.[33]

Our calculations further suggest that the statewide flavored tobacco restriction policy has reduced tobacco tax revenues more than would be predicted from local flavor policies during its first year following implementation. One contributor may be the wide variation in the strength of local flavor policies, many of which were less stringent than the statewide policy. Another contributor may be that consumers can more easily avoid local restrictions through cross-border shopping in nearby unregulated jurisdictions, whereas the statewide policy would make such consumer avoidance behavior more difficult. Moreover, our accounting ignores the secular declines in California tobacco tax revenues that have occurred over time, which would not be attributable to SB 793 and would lead us to overstate the statewide policy's impact. Nevertheless, SB 793 faced some implementation challenges, as the state law did not provide enforcement authority to any state agency and retailer compliance with the law lagged. California has since passed a new law (Assembly Bill 935), effective January 1, 2024, that clarifies that the California Department of Public Health is the state's lead agency for enforcing the state law, in collaboration with other state agencies and local authorities.[34] We would expect that as statewide enforcement strengthens, the statewide policy would have a greater effect on tax revenues.

iv. Impact of SB 793 on tobacco retailers

Retailers, predominantly specialty tobacco retailers, reported high levels of confusion about the law, most notably which products were restricted. This was exacerbated by struggles to get accurate information from government authorities, leading retailers to rely on distributors or other retailers for information. Retailers described their responses to sales restrictions, including selling alternative products of interest to their clientele, like anime plushies and glassware. They noted concerns that customers would go elsewhere to obtain tobacco products, including the illicit market or other states. Though retailers reported little observed enforcement from regulatory entities, they expressed concern about breaking the law. This study is the first to examine how retailers in communities with a high proportion of African-American/Black residents experienced a flavored tobacco sales restriction and adds to the mixed existing literature on the impact of flavor policies on African-American/Black communities.

Retailers described how the state law could have unintended impacts on their distressed businesses and estimated decreased revenue ranging from 15-75% post-SB 793. This was most acute among vape stores because their income came primarily from tobacco sales. Retailers anticipated having to lay off employees, and said many local retailers, including themselves, may have to close. Retailers frequently described unhappy customers who did not know about the restrictions and were frustrated that it limited their

choice. While SB 793 could be an opportunity for people to quit using tobacco, this may be less likely if people are able to turn to other avenues to purchase their preferred tobacco products. A potential unintended consequence is switching from flavored tobacco to flavored cannabis.

v. Overall summary

In summary, these policies reduced tobacco sales substantially within the jurisdictions where they were put into effect and, in most cases, did so without displacing sales to nearby areas or harming the sale of non-tobacco products, thereby supporting their effectiveness and viability as public health measures. These analyses provide compelling evidence for the potential broader adoption of such measures. These insights also offer valuable guidance for policymakers aiming to craft impactful public health strategies without detrimental economic outcomes.

B. Implications of the results for the State

More than 100 California cities, including many of the most populous cities in the state, had a local flavored tobacco sales restriction prior to SB 793 going into effect. A majority of the state's population were exposed to local flavor policies. Our estimates indicate that these local policies reduced tobacco use by eight to nine percent, an effect of large magnitude that would be expected to have resulted in health improvements.

The experiences of local jurisdictions with flavored tobacco sales restrictions may hold important lessons for the expected impacts of SB 793. First, the local policies did not trigger any detectable increase in cross-border shopping. Local policies are much easier to evade through cross-border shopping than are state (or federal) policies, suggesting that SB 793 is unlikely to cause a large degree of geographic displacement to neighboring states. Second, the local policies did not measurably harm revenue streams from non-tobacco product lines among tobacco retailers included in the scanner data. If this finding translates to SB 793, then the economic impacts should be relatively contained to tobacco product sales. Our key informant interviews highlight that tobacco specialty shops, which rely more heavily on flavored tobacco product sales and were not included in the scanner data sample, will be disproportionately harmed. The state might consider whether additional supports are needed for this subset of retailers.

Our tax revenue calculations further suggest that the statewide flavored tobacco restriction policy impacted tobacco tax revenues more than would be predicted from local flavor policies during its first year following implementation. One contributor may be the wide variation in the strength of local flavor policies, many of which were less stringent than the statewide policy. Another contributor may be that consumers can more easily avoid local restrictions through cross-border shopping in nearby unregulated jurisdictions, whereas the statewide policy would make such consumer avoidance behavior more difficult. Moreover, our accounting ignores the secular declines in California tobacco tax revenues that have occurred over time, which would not be attributable to SB 793 and would lead us to overstate the statewide policy's impact. Nevertheless, SB 793 faced some implementation challenges, as the state law did not provide enforcement authority

to any state agency and retailer compliance with the law lagged. California has since passed a new law (Assembly Bill 935) that clarifies that the California Department of Public Health is the state's lead agency for enforcing the state law, in collaboration with other state agencies and local authorities.[34] We would expect that as statewide enforcement strengthens, the statewide policy would have a greater effect on tax revenues.

Beverly Hills and Manhattan Beach are the first cities in the state, and the nation, to put into effect local no-sales of tobacco policies. The early experiences in these two early adopters have important implications for the replication and scalability of this policy strategy. We found evidence of full compliance with the no-sales policy among sampled stores in Beverly Hills and Manhattan Beach, highlighting the viability of enforcing the policy approach. While we did not observe cross-border shopping or harms to retailers in terms of non-tobacco sales in Beverly Hills, there was some evidence for these effects in Manhattan Beach. We might expect that no-sales policies would have similarly disparate effects if implemented more widely by local jurisdictions. A statewide no-sales policy would make geographic displacement of tobacco and non-tobacco products much less likely, thereby removing these potential limitations of the policy. Thus, the balance of evidence from this study suggests that a no-sales of tobacco policy is feasible and can be pursued at the local level without substantial financial harm to retailers or the local tax base.

C. Strengths and limitations

This study has notable strengths. It draws custom store-level data from a large set of retailers statewide and uses advanced econometric methods. The study provides the first estimates of the effects of local flavored tobacco sales restrictions and local no-sales of tobacco restrictions in California. Findings from the flavor policy analyses provide an indication of the anticipated impacts from California's statewide flavored tobacco restriction. Findings from the no-sales policy analyses offer a first look at the local economic effects for an innovative policy approach being considered by other California localities.

This study has several limitations. First, the retail sales data identified purchasing behavior and not direct consumption. It is possible that policy-affected populations consumed a different share of purchased tobacco products than did policy-unaffected control populations (e.g., sharing with others). Second, the retail sales data contain only a sample of stores in each city, and thus do not include all sales. The incomplete sales coverage, while comparable to the commonly used NielsenIQ Retail Scanner Data, could introduce bias into our estimates to the extent that excluded stores experienced different customer responses than included stores or to the extent that sales shifted differentially over time from included stores to excluded stores in treated versus control cities. Moreover, given that the sales data were primarily drawn from a sample of large chain stores, these results may not extend to independent stores, smaller retailers, tobacco specialty stores, or online sales. This may be an important omission because smaller retailers in Beverly Hills and Manhattan Beach had self-reported larger revenue losses following the sales ban.[19] The results also may not generalize to cities with a different socio-demographic profile, tobacco retail landscape, or policy environment from the

treated cities. This may be particularly relevant to the tax revenue analyses, in which we find that local flavor policies had a smaller impact than did SB 793 in its first year following implementation. Third, our primary outcomes are measured using unit sales. If consumers switch package sizes over time, this may be missed by a count of unit sales, as opposed to volume sales. However, we did not observe any substantial or systematic substitution toward larger or smaller package sizes, suggesting that this is unlikely to be a major concern.

D. Recommendations

1. The findings suggest that retail scanner data can play an important role for the evaluation of local policies. CTPP should explore with the Tobacco-Related Disease Research Program and other stakeholders whether to license a custom retail scanner data set from one of the major data providers (i.e., Nielsen or Circana) for surveillance and rapid evaluation of local policies. The CDC Foundation has constructed a similar data set for state trends, and this could be a model for innovative local policy tracking. Such a licensing program would require capacity development to clean, process, and analyze the data, which is a substantial undertaking but one with tremendous potential. Ongoing work by the PETS team would complement these efforts. CDPH could potentially make the database available to contractors for directed policy evaluations of the sort undertaken in the current study.
2. CTPP should develop an evaluation strategy in anticipation that additional cities adopt a local no-sales of tobacco policy. Given the novelty of these policies and lack of evidence regarding their effectiveness, it is critical to improve the understanding of the economic impacts of no-sales of tobacco policies. CTPP could help to fill this evidence gap for California (and the rest of the world) by prospectively designing evaluations of no-sales policies. Options for an evaluation approach could involve use of retail scanner data, secret shoppers, retail store audits of product availability and prices, qualitative interviews with retailers, survey data analysis, or a combination of approaches. Our findings point particularly to the need for evaluations to account for any potential cross-border shopping and spillovers to non-tobacco sales revenues.
3. Findings from the key informant interviews suggest that there are opportunities to engage with stakeholders when the State of California adopts new tobacco regulations. Gathering input from tobacco retailers and other stakeholders in advance might help to anticipate the needs and challenges that different stakeholder groups face and to coordinate appropriate responses with other government agencies as appropriate. In the lead-up and aftermath of the policy going into effect, it becomes important to communicate clear information and guidance about the policy. For example, retailers recommended that the state provide a centralized database or website that lists the tobacco products allowable for sale.
4. Some retailers suggested during the key informant interviews that customers were responding to SB 793 by switching from flavored tobacco to flavored cannabis. CTPP may want to study the frequency with which this transition is happening. Such substitution patterns would have important implications for the public health impacts of the law.

5. Retail scanner data can help to address some evaluation questions that other data sources cannot, such as the broader retailer impacts, although the data source does not lend itself to documenting health equity impacts for priority populations because it has no information on individual consumers. Future evaluations might consider pairing retail scanner data with other data sources, such as population surveys and consumer scanner data, in order to evaluate the impacts of policies on specific population groups.

E. Conclusions

This report details the effectiveness of two types of local tobacco sales restrictions in achieving significant reductions in tobacco consumption across California. By considering substitution to other tobacco products, cross-border shopping, and sales of non-tobacco products, the analyses aimed to characterize more comprehensively the impacts of these policies. This report also points to some of the opportunities and challenges of using retail scanner data for policy evaluation.

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APPENDIX A. SUPPLEMENTAL METHODS AND RESULTS

This appendix contains additional details on the methods described in the report.

A. ANALYSIS OF LOCAL FLAVOR POLICIES

i. Main analysis of tobacco sales

We use a difference-in-differences regression framework to examine the effects of local flavored tobacco sales restrictions in California on the sale of tobacco products. Difference-in-difference estimation compares the average change in outcomes in the treated group and that in the comparison (control) group. The treated group is comprised of cities that have a local flavored tobacco sales restriction, while the control group consists of cities that do not have a flavor policy. We exploit the variation across cities and over time using the following two-way fixed effects setup:

$$Y_{ct} = \beta_0 + \beta_1(Policy_c \times Post_t) + \phi_t + \alpha_c + \varepsilon_{ct} \quad (1)$$

where Y_{ct} indicates the outcome for city c in month t. Outcomes, as described above, include total unit sales of all targeted tobacco products, total unit sales of targeted flavored and unflavored products, and total unit sales by product category. $Policy_c$ equals "1" if the city c has a local flavored tobacco sales restriction and "0" otherwise. $Post_t$ equals "1" if it is after the effective date of the policy. ϕ_t represents month-year fixed effects, and α_c denotes city fixed effects. The month-year fixed effects account for secular trends (period-specific events) that are common to all cities (e.g., the COVID-19 pandemic and state tobacco taxes), and the city fixed effects account for all city characteristics that do not vary during the study period. Thus, a main threat to validity of this approach would be other factors (e.g., other tobacco policies) that vary over time differentially among cities in the treated group. The coefficient of interest is β_1, which identifies the DD estimate of the effect of local flavor policies. Standard errors are clustered at the city level to account for correlated outcomes within each city over time.

For estimates of cross-border shopping, Equation 1 is modified to define the policy exposure as cities that border a city with a local flavored sales restriction policy.

ii. Event study difference-in-differences

To examine how the effects of local flavor policies change over time, we estimated event study difference-in-differences analyses of the time-varying relationship between policy exposure and our outcomes of interest. An important assumption of difference-in-differences is that before-after differences in outcomes would be the same in the intervention and comparator groups in the absence of the policy. While this "parallel trends" assumption is not directly testable, we followed the literature to assess whether pre-policy outcome trends were parallel between treated and control groups by testing the significance of pre-policy coefficients in the event studies.[35, 36]

We generated event study plots of the treatment effects at each time point (vertical axis) versus month centered relative to time of treatment such that the month of first treatment equals "0" (horizontal axis). The event study plots allow for visual inspection of parallel trends and dynamic treatment effects.[37]

The event study plots provided information about the extent to which there might be violations of the so-called parallel trends assumption upon which difference-in-differences estimates rest. This assumption requires that outcome trends are similar across groups in the counterfactual scenario in which cities were not treated (conditional on the fixed effects and any covariates). Violations of parallel trends would be visible through significant differences between the treated and control groups prior to a flavor policy going into effect, indicated in the figure by the red "pre-trend coefficients." The pre-trend coefficients overlap zero and thus are not significantly different across any of the product categories, suggesting that we did not detect any violations of the parallel trends assumption. This increases our credence in the appropriateness of the empirical model.

Appendix Figure 3 shows the change over time in the effect of having any local flavor policy on tobacco and NRT product sales. These estimates are expressed as percent changes relative to the sales in the treated group during the month prior to the policy effective date and were derived from event study difference-in-differences models. The event study estimates are consistent with the overall effects described above. In particular, the difference in overall tobacco sales grows between the treated and control groups over time. This overall decline is driven by a decline in the sale of flavored tobacco products that were targeted by the policy. The sale of unflavored products increased somewhat following policies going into effect, though by a smaller magnitude than the decline in targeted flavored products, hence resulting in an overall decline. All tobacco product categories experienced a decline in sales following any local flavored policy going into effect, although the decline is not significant in most months for cigarettes and cigars. The sales decline is greatest for SLT products, such that sales declined by approximately 30-40% two years after a flavor policy was put into effect. ENDS sales declined by a magnitude of approximately 20%. In contrast, NRT product sales remained flat following any flavor policy going into effect.

iii. Effects by tobacco retail licensing status

Local flavor policies may have larger impacts if they are more strongly enforced. While the strength of enforcement cannot be directly measured for all cities, we use the existence of a local ordinance that establishes tobacco retail licensing (TRL) restrictions as a proxy for cities with stronger enforcement. Appendix Table 8 displays the impacts of having any flavored policy on the sale of tobacco and NRT products, restricting treated cities to those with a TRL ordinance. The results do not fully conform with the hypothesis. While we observe declines in the sale of flavored tobacco products across both sets of cities, the magnitudes of the declines are counterintuitively larger among cities that did not have a TRL ordinance. There is not much variation in TRL status, such that 87% of treated cities (n=93) had a TRL, and this may have limited the power of this test.

iv. Callaway-Sant'Anna difference-in-differences

Growing economics literature suggests that standard difference-in-differences models may suffer from bias in the presence of variation in treatment timing, such as staggered adoption of policies.[38-41] The difference-in-differences approach developed by Callaway and Sant'Anna is one of the leading recently developed methods to address the potential biases that occur with standard difference-in-differences in the presence of treatment timing variation. The Callaway-Sant'Anna approach has also been shown to require weaker assumptions than certain

alternatives.[41] Further, the Callaway-Sant'Anna difference-in-differences estimator is able to incorporate a "doubly robust" approach with inverse probability weighting that can help meet the parallel trends assumption of difference-in-differences analysis.[42, 43] We, therefore, use the doubly robust version of the Callaway-Sant'Anna estimator as our estimation strategy, adjusting for several city-level characteristics drawn from the 2010 Census: total population, mean household income, percent Hispanic, percent non-Hispanic Black, percent non-Hispanic White, percent non-Hispanic Asian, and percent "other" race/ethnicity. To make this more computationally intense model tractable, we estimate it using quarterly data.

As with standard difference-in-differences models, the Callaway-Sant'Anna model assumes parallel outcome trends between treated and control units. We conducted event study difference-in-difference models, described above, to test parallel pre-policy outcome trends as suggestive evidence of this assumption.

Appendix Table 9 shows the results of the Callaway-Sant'Anna difference-in-differences estimation for the effects of any local flavor policy. The results tended to be larger in magnitude compared to the results from the main analysis. The overall decline in tobacco sales was 10.8% (compared with 8.4% in the main analysis). The decline in flavored products (-47.5%) and increase in unflavored products (9.0%) were also larger in magnitude, as was the decline in SLT products (-27.7%) and ENDS (-35.2%). In contrast with the main analysis and event study estimates, the Callaway-Sant'Anna model indicates that NRT product sales increased by 9.7% in treated areas.

The event study plots from the Callaway-Sant'Anna model of the effects of any flavor policy is shown in Appendix Figure 4. It follows a similar pattern as the event study from the main analyses.

v. Effects by store type

One potential source of heterogeneity of effects is store type. Different types of stores carry different types of products and may have been more or less likely to comply with the policy. Further, any differential impacts may have implications for how flavor policies are designed, how they affect the broader retail environment, and whether any specific supports should be targeted to specific types of retailers.

To explore effect heterogeneity across different store types, we estimate stratified models by store type: convenience stores, drug stores, and grocery stores (Appendix Table 10). The results indicate that any flavor policy going into effect decreased tobacco product sales across all store types. However, the larger declines occur in drug stores (-9.5%), followed by convenience stores (-9.2%), and grocery stores (a non-significant -1.9%). We also estimated the effect of any flavor policy going into effect on total non-tobacco product sales, in dollars (Appendix Table 11). While overall dollar sales of non-tobacco products increased by 1.0%, we did observe small declines across the individual store types, none of which were statistically significant, ranging from -0.3% in convenience stores to -1.1% in drug sales. The uncertainty around our estimates suggest that we can rule out with 95% confidence that retailers experienced sales declines greater than 3.5% in drug stores and grocery stores and 10% in convenience stores. However, these would represent meaningful sales declines for many stores, suggesting that our estimates carry enough uncertainty that the lack of a decline in non-tobacco sales should be interpreted with a degree of caution.

B. ANALYSIS OF LOCAL NO-SALES OF TOBACCO POLICIES

The analysis uses the recently developed synthetic difference-in-differences (SDID) estimation approach.[29] SDID brings together the strengths of difference-in-differences and synthetic control methods. Similar to synthetic control analysis, SDID is a data-driven approach that applies weights to control units in order to construct a weighted average of all potential control (non-treated) localities that best match the treated area on both the pre-treatment outcome and a set of prognostic factors.[30] SDID thereby constructs a counterfactual outcome for what would have happened to the treated area in the absence of treatment. Doing so relaxes the parallel trends assumption required under a standard difference-in-differences approach. SDID adds time weights that align pre-exposure trends in the outcome of unexposed units with those for exposed units. SDID has been shown to have excellent performance compared with synthetic control and alternative approaches in terms of bias and root-mean-squared error,[29] is feasible when the parallel trends assumption is not met, and relaxes the "convex hull condition" for synthetic control analyses that requires mean outcomes of treated units to be within the distribution of the control data. Our SDID model includes fixed effects (i.e., indicators) for geographic area (city or border ZIP code) and year-month, thereby adjusting for all time-invariant city characteristics and secular trends.

Synthetic control methods have previously been used to evaluate tobacco control programs and policies in California, including Proposition 99 and the 2017 cigarette tax increase.[30, 44] SDID is a state-of-the-art approach that has yet to be used in the tobacco control literature, to our knowledge.

Statistical inference for SDID can be done in several ways. However, with only two treated units, only the permutation-based approach is feasible. Under this approach, placebo estimates were generated for randomly sampled cities in the donor pool of control cities as if that sampled city had been subject to a no-sales policy. The placebo estimate factors in the unit and time weights used to construct the synthetic control according to the algorithm specified by Arkhangelsky and colleagues.[29] We repeated this procedure for 50 iterations. A standard deviation of the placebo estimates is used to generate 95% confidence intervals and corresponding event study plots. In sensitivity testing, we tested the robustness of the estimates to use of 250 iterations.

i. Unit-specific weights

The SDID procedure constructs a weighted average of potential control cities to match each treated city. The 20 donor pool cities that received the most weight for each treated city are listed in Appendix Table 13. No single city contributed more than five percent to the synthetic control for Beverly Hills or more than 15% for Manhattan Beach.

C. ANALYSIS OF TOBACCO TAX REVENUES AND RELATED PROGRAM FUNDING

i. Approach

We used a custom store-level data set from NielsenIQ to assess the impact of local flavor and no-sales policies on retail sales. Details are provided in our companion report.[21] We combine

estimates of the policy effects with data on 2022 tax revenue for cigarettes and ENDS, publicly available through the California Department of Tax and Fee Administration (CDTFA) on its website.[45] Tax revenues for ENDS are for 2022 are provided by CDTFA through a special request, and 2023 ENDS tax revenues are derived from monthly ENDS unit sales reported by the CDC Foundation using retail sales data from Circana.[46]

For each policy type, we consider two different counterfactual scenarios.

1) Lost revenue from the adoption of the sales restrictions by selected California localities (i.e., if the treated cities had not been treated).
2) Anticipated lost revenue if all California cities had adopted the local sales restrictions (i.e., if untreated cities had been treated).

For the flavored tobacco policy analysis, we then compare our projections of the change in tax revenue under scenario #2 to the actual change in 2023 tax revenues during the first year following SB 793.

In calculating the expected decline under each scenario, we rely on the findings from our related work.[21] Specifically, we apply our difference-in-differences estimates of the effects of local flavored policies to forecast the effect of untreated cities having a flavored tobacco sales restriction, as well as the effect of treated cities not having one. For the analyses of no-sales of tobacco policies, we assume perfect compliance (i.e., no tobacco sales) as we observed among sampled Beverly Hills and Manhattan Beach stores in the aftermath of their policies.

We make two major assumptions when scaling our local policy effect estimates to the entire state. First, CDTFA data is publicly available for the entire state and not disaggregated by city; we therefore assume that the proportion of tobacco sales that occur in treated cities versus control cities in the NielsenIQ retail scanner data matches the proportion statewide. Second, CDTFA does not publicly report tax revenues for cigars and SLT, to our knowledge. We therefore assume that the ratio of sales for these products to cigarettes (whose tax revenue is available through CDTFA) is the same in the NielsenIQ data as the ratio statewide.

ii. Program funding calculations

We applied the proportion of the current cigarette tax due to Prop 99 (8.7% = $0.25 / $2.87 per pack) to the calculation of tax revenue change under each counterfactual scenario. We report the impacts on Prop 99 funding in aggregate, rather than dividing into separate Prop 99 programs.

For Prop 56, we similarly took the applicable proportion of the current tax across the different tobacco product categories (69.7% = $2.00 / $2.87). We then used the formula provided in Chapter 2, Article 2.5, Section 30130.55 of California's Cigarette and Tobacco Products Tax Law to determine the distribution of tobacco tax revenues. According to this formula, the revenues are to be apportioned in the following manner: 82% to the Department of Health Care Services (DHCS through the Healthcare Treatment Fund; 13% to tobacco prevention and control programs, of which 85% is distributed to the CDPH California Tobacco Prevention Program (CDPH/CTPP) and 15% to the California Department of Education (CDE); and 5% to the University of California for the Tobacco-Related Disease Research Program (TRDRP). We calculated the proportion of tax revenue distributed to each of these programs using this formula.

The calculations for Prop 56 and Prop 99 expenditures are the amounts prior to any adjustments to account for administrative spending or any other adjustments required by law.

APPENDIX B. APPENDIX TABLES AND FIGURES

Appendix Tables

Appendix Figures

Appendix Table 1. Summary statistics for analysis of local flavor policies

	Control	Treated	Total
Total unit sales, all tobacco	21,246 (22,631)	25,932 (57,964)	22,437 (35,209)
Total unit sales, by category			
Cigarettes	12,646 (14,636)	15,899 (36,417)	13,435 (22,036)
Cigars (big, little)	3,920 (5,740)	5,388 (15,516)	4,281 (9,188)
Smokeless tobacco	2,312 (2,449)	2,026 (3,816)	2,239 (2,866)
ENDS	546 (680)	629 (1,553)	568 (991)
NRT	64 (79)	130 (262)	81 (153)
Race/ethnicity (%)			
Non-Hispanic White	46.0 (23.0)	49.9 (24.7)	47.0 (23.5)
Non-Hispanic Black	4.4 (5.4)	4.8 (7.0)	4.5 (5.8)
Asian	10.2 (12.2)	14.1 (13.2)	11.2 (12.5)
Hispanic	36.5 (22.8)	28.2 (21.9)	34.4 (22.8)
Median household income ($)	2.9 (1.3)	3.1 (1.2)	2.9 (1.3)
Population	88,364 (29,587)	111,823 (40,319)	94,246 (34,160)
Number of UPCs	4,914	3,998	5,077
Number of stores	2,284	964	3,248
Number of cities	418	110	528

Note: Standard deviations are shown in parentheses. The control group is composed of cities that do not have a local flavored tobacco sales restriction in effect, while the treated group includes cities with such restrictions on local flavored tobacco sales. Race/ethnicity is presented as percentages of the total population.

Appendix Table 2. Effects of any local flavor policy on unit sales of tobacco and NRT products

	Among targeted product categories			By product category				
	All	Flavored	Unflavored	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-2479.0***	-3150.7***	665.2**	-1392.4***	-548.3***	-483.3***	-211.4***	0.4
	(473.0)	(532.5)	(284.3)	(395.5)	(171.0)	(72.5)	(30.8)	(5.2)
No. obs.	31,608	31,442	31,605	31,454	29,962	27,663	27,703	6,086
Mean DV	29,377.9	11,360.9	18,029.5	20,803.0	6,160.3	2,084.6	842.8	102.0
ATT as % change	-8.4	-27.7	3.7	-6.7	-8.9	-23.2	-25.1	0.4
	[-11.6, -5.3]	[-36.9, -18.5]	[0.6, 6.8]	[-10.4, -3.0]	[-14.3, -3.5]	[-30.0, -16.4]	[-32.2, -17.9]	[-9.5, 10.3]

Note: This table shows the effect of cities implementing any policy restricting flavored tobacco products (n=109), compared with cities without one (n=417). Targeted products refer to product categories regulated by the flavor policy. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data from April 2018 through November 2022 are collapsed to the city-by-month level. Robust standard errors, clustered at city level, are shown in parentheses below estimates. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT as % change = the ATT expressed as a percent change relative to the mean DV, with its 95% CI in brackets below. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 3. Effects of local ENDS-only flavor policies on unit sales of tobacco and NRT products

	Among targeted product categories			By product category				
	All	Flavored	Unflavored	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-272.5	-225.1*	-51.8	853.3	435.5	394.0	-272.5	-13.6***
	(172.9)	(125.7)	(56.8)	(1160.4)	(560.5)	(280.0)	(172.9)	(3.2)
No. obs.	21,589	20,936	21,417	25,327	24,126	22,293	21,589	4,752
Mean DV	624.7	459.0	165.7	9,258.3	2,105.9	1,347.5	624.7	22.4
ATT as % change	-43.6	-49.0	-31.3	9.2	20.7	29.2	-43.6	-60.6
	[-97.9, 10.6]	[-102.7, 4.6]	[-98.4, 35.9]	[-15.3, 33.8]	[-31.5, 72.8]	[-11.5, 70.0]	[-97.9, 10.6]	[-88.5, -32.7]

Note: This table shows the effect of cities implementing a policy restricting flavored ENDS only (n=6), compared with cities without one (n=411). Targeted products refer to product categories regulated by the flavor policy. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data from April 2018 through November 2022 are collapsed to the city-by-month level. Robust standard errors, clustered at city level, are shown in parentheses below estimates. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT as % change = the ATT expressed as a percent change relative to the mean DV, with its 95% CI in brackets below. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 4. Effects of local flavor policies restricting ENDS, combustible tobacco, and smokeless tobacco on unit sales of tobacco and NRT products

	Among targeted product categories			By product category				
	All	Flavored	Unflavored	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-2678.2***	-3209.4***	523.9**	-1369.1***	-705.4***	-576.8***	-211.5***	0.9
	(428.8)	(453.4)	(262.3)	(326.5)	(171.9)	(65.1)	(30.5)	(5.3)
No. obs.	31,120	30,954	31,117	30,966	29,474	27,175	27,219	6,001
Mean DV	29,606.8	11,424.5	18,195.9	20,928.9	6,267.5	2,116.9	852.0	105.4
ATT as % change	-9.0	-28.1	2.9	-6.5	-11.3	-27.2	-24.8	0.8
	[-11.9, -6.2]	[-35.9, -20.3]	[0.1, 5.7]	[-9.6, -3.5]	[-16.6, -5.9]	[-33.3, -21.2]	[-31.8, -17.8]	[-9.0, 10.7]

Note: This table shows the effect of cities implementing a policy restricting flavored ENDS, combustible tobacco, and smokeless tobacco products (n=101), compared with cities without one (n=417). Targeted products refer to product categories regulated by the flavor policy. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data from April 2018 through November 2022 are collapsed to the city-by-month level. Robust standard errors, clustered at city level, are shown in parentheses below estimates. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT as % change = the ATT expressed as a percent change relative to the mean DV, with its 95% CI in brackets below. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 5. Effects of local flavor policies restricting menthol products on unit sales of tobacco and NRT products

	Among targeted product categories				By product category				
	All	Menthol	Other flavored	Unflavored	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-1568.3***	-2278.8***	-1659.7***	704.9**	-1863.9***	-698.5***	-616.6***	-218.7***	-2.7
	(391.9)	(463.4)	(256.0)	(351.3)	(490.0)	(214.4)	(68.2)	(34.3)	(4.6)
No. obs.	30,144	29,973	28,613	30,141	29,990	28,563	26,416	26,253	5,765
Mean DV	28,337.0	7,371.8	5,988.3	20,983.6	24,336.1	7,342.6	2,342.7	965.1	122.2
ATT as % change	-5.5	-30.9	-27.7	3.4	-7.7	-9.5	-26.3	-22.7	-2.2
	[-8.2, -2.8]	[-43.2, -18.6]	[-36.1, -19.3]	[0.1, 6.6]	[-11.6, -3.7]	[-15.2, -3.8]	[-32.0, -20.6]	[-29.6, -15.7]	[-9.7, 5.2]

Note: This table shows the effect of cities implementing a policy restricting menthol products (n=85), compared with cities without one (n=417). Targeted products refer to product categories regulated by the flavor policy. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data from April 2018 through November 2022 are collapsed to the city-by-month level. Robust standard errors, clustered at city level, are shown in parentheses below estimates. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT as % change = the ATT expressed as a percent change relative to the mean DV, with its 95% CI in brackets below. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 6. Effects of any flavor policy on cross-border shopping in unit sales

	Among targeted product categories			By product category				
	All	Flavored	Unflavored	Cigarettes	Cigars	Smokeless	ENDS	NRT
ATT	181.0	359.6	-178.5	-103.8	134.9	146.7*	11.9	3.6
	(409.2)	(219.6)	(244.9)	(297.2)	(126.9)	(86.2)	(25.0)	(11.6)
No. obs.	25,150	25,130	25,150	25,144	23,942	22,004	21,407	4,759
Mean DV	18,624.9	7,302.0	11,325.3	13,021.8	3,521.8	1,780.2	601.1	61.0
ATT, % change	1.0	4.9	-1.6	-0.8	3.8	8.2	2.0	5.9
	[-3.3, 5.3]	[-1.0, 10.8]	[-5.8, 2.7]	[-5.3, 3.7]	[-3.2, 10.9]	[-1.2, 17.7]	[-6.2, 10.1]	[-31.6, 43.3]

Note: This table shows the effect for cities bordering a city with any local flavor policy (n=100), compared with non-border cities without a local flavor policy (n=320). Targeted products refer to product categories for which flavored products were regulated by the policy. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data are collapsed to the city-by-month level. The treated group is composed of never-treated cities bordering a city with a flavor policy, and the control group is composed of never-treated cities not bordering a city with a flavor policy. Cities with a flavor policy are dropped from the analysis. Robust standard errors, clustered at city level, are shown in parentheses below estimates. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT, % change = the ATT expressed as a percent change relative to the mean DV, with its 95% CI below. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 7. Effects of local flavor policies on dollar sales of non-tobacco products, by policy type

	Policy type			
	Any flavor policy	ENDS flavor policy	ENDS + combustibles + SLT flavor policy	Menthol policy
Total non-tobacco sales				
ATT	46,214	26,511	22,086	53,348
	(79,152)	(154,791)	(82,302)	(103,643)
ATT as % change	1.0	1.2	0.4	1.0
	[-2.2, 4.2]	[-12.3, 14.6]	[-2.8, 3.7]	[-2.8, 4.7]
Sales by store department				
Baby care				
ATT	-688	608	-983	-923
	(618)	(1,882)	(653)	(791)
ATT as % change	-1.7	3.6	-2.3	-2.0
	[-4.6, 1.3]	[-18.4, 25.6]	[-5.3, 0.7]	[-5.3, 1.3]
Bakery				
ATT	392	870	30	602
	(1,161)	(3,137)	(1,219)	(1,494)
ATT as % change	0.7	3.0	0.0	0.9
	[-3.1, 4.5]	[-18.1, 24.0]	[-3.8, 3.9]	[-3.5, 5.3]
Dairy				
ATT	8,405	-3,979	5,872	11,065
	(11,600)	(21,257)	(12,005)	(15,258)
ATT as % change	1.1	-1.2	0.8	1.3
	[-1.9, 4.2]	[-13.8, 11.4]	[-2.3, 3.9]	[-2.3, 5.0]
Deli				
ATT	-1,723	-2,853	-2,627	-1,742
	(3,997)	(10,441)	(4,226)	(5,165)
ATT as % change	-0.9	-3.1	-1.3	-0.8
	[-4.9, 3.1]	[-25.1, 19.0]	[-5.4, 2.8]	[-5.5, 3.9]
Frozen				
ATT	8,166	4,205	5,713	8,714
	(9,114)	(18,118)	(9,443)	(11,876)
ATT as % change	1.8	1.9	1.2	1.7
	[-2.2, 5.8]	[-14.4, 18.3]	[-2.8, 5.2]	[-2.9, 6.4]
General merchandise				
ATT	-1,599*	-1,097	-2,068**	-1,338
	(896)	(2,738)	(860)	(1,121)
ATT as % change	-1.8	-2.3	-2.2	-1.3
	[-3.7, 0.2]	[-13.3, 8.8]	[-4.1, -0.4]	[-3.5, 0.9]
Grocery				
ATT	28,349	11,217	19,208	35,108
	(34,749)	(58,250)	(36,492)	(45,701)
ATT as % change	1.4	1.2	0.9	1.5
	[-2.0, 4.7]	[-11.0, 13.4]	[-2.5, 4.3]	[-2.4, 5.4]
Health & beauty care				
ATT	-5,879*	2,856	-8,266***	-8,723**

	(2,993)	(8,189)	(3,036)	(3,669)
ATT as % change	-1.7	1.6	-2.3	-2.2
	[-3.4, -0.0]	[-7.4, 10.6]	[-4.0, -0.6]	[-4.1, -0.4]
Household care				
ATT	-1,657	149	-3,361	-1,976
	(3,280)	(7,499)	(3,320)	(4,262)
ATT as % change	-0.5	0.1	-1.0	-0.6
	[-2.6, 1.5]	[-9.8, 10.0]	[-3.0, 1.0]	[-2.9, 1.8]
Meat				
ATT	635	1,965	-888	584
	(5,101)	(8,988)	(5,392)	(6,709)
ATT as % change	0.3	1.8	-0.4	0.2
	[-3.9, 4.5]	[-14.5, 18.2]	[-4.7, 3.9]	[-4.7, 5.1]
Produce				
ATT	6,622	5,522	4,465	6,760
	(8,307)	(18,309)	(8,628)	(10,596)
ATT as % change	1.9	3.8	1.2	1.7
	[-2.8, 6.6]	[-20.8, 28.3]	[-3.4, 5.9]	[-3.6, 7.1]
Seafood				
ATT	175	-38	165	293
	(228)	(333)	(243)	(297)
ATT as % change	2.5	-1.6	2.2	3.6
	[-3.9, 8.8]	[-28.3, 25.2]	[-4.2, 8.7]	[-3.6, 10.9]

Note: Coefficients, in dollars, represent the average treatment effect on the treated (ATT) of the change in sales in the treated group relative to the change in the control group following any flavor policy going into effect. Robust standard errors, clustered at city level, are shown below the ATT estimates in parentheses. The ATT as % change is the ATT expressed as a percent change relative to the pre-policy mean dependent variable in the treated group, with 95% CI shown in brackets. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data are collapsed to the city-by-month level.
Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 8. Effects of any flavor policy on unit sales of tobacco and NRT products in cities with a TRL

	Among targeted product categories			By product category				
	All	Flavored	Unflavored	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-2662.1***	-3388.1***	718.0**	-1471.6***	-601.0***	-478.7***	-220.3***	2.4
	(543.5)	(619.8)	(323.6)	(453.9)	(202.2)	(80.2)	(35.3)	(5.6)
No. obs.	30,633	30,467	30,630	28,988	26,809	26,733	5,918	28,988
Mean DV	33,313.9	12,943.5	20,387.7	7,148.1	2,223.2	960.0	110.5	7,148.1
ATT as % change	-8.0	-26.2	3.5	-8.4	-21.5	-22.9	2.2	-8.4
	[-11.2, -4.8]	[-35.6, -16.8]	[0.4, 6.6]	[-14.0, -2.9]	[-28.6, -14.5]	[-30.1, -15.7]	[-7.7, 12.1]	[-14.0, -2.9]

Note: This table shows the effect of cities with a tobacco retail licensing (TRL) ordinance implementing any policy restricting flavored products (n=93), compared with cities without a policy (n=417). Targeted products refer to product categories for which flavored products were regulated by the policy. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data for April 2018 through November 2022 are collapsed to the city-by-month level. Robust standard errors, clustered at city level, are shown in parentheses. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT as % change = the ATT expressed as a percent change relative to the pre-policy mean dependent variable in the treated group, with 95% CI shown in brackets.
Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 9. Effects of any flavor policy on unit sales of tobacco and NRT products using Callaway-Sant'Anna estimation

	Among targeted product categories			By product category				
	All	Flavored	Unflavored	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-6522.4***	-10159.6***	3525.7**	-3105.4***	-1805.2*	-1499.9***	-635.9***	30.2*
	(1944.10)	(1834.26)	(1760.68)	(1062.14)	(966.66)	(288.07)	(113.64)	(16.92)
No. obs.	9,681	9,655	9,681	9,624	9,275	8,775	8,691	3,863
Mean DV	60,403.75	21,385.96	39,017.79	40,800.57	15,065.28	5,405.85	1,808.67	310.90
ATT as % change	-10.8	-47.5	9.0	-7.6	-12.0	-27.7	-35.2	9.7
	[-17.1, -4.5]	[-64.3, -30.7]	[0.2, 17.9]	[-12.7, -2.5]	[-24.6, 0.6]	[-38.2, -17.3]	[-47.5, -22.8]	[-1.0, 20.4]

Note: This table shows the effects of any local flavor policy going into effect on tobacco and NRT product sales, based on a Callaway-Sant'Anna difference-in-differences model with doubly-robust estimation. Data are collapsed to the city-by-quarter level. The treated group is composed of never-treated cities bordering a city with a flavor policy, and the control group is composed of never-treated cities not bordering a city with a flavor policy. Cities that had a flavor policy prior to the start of the study period were removed from the analysis. Robust standard errors are clustered at city level. Standard errors are shown below the estimates in parentheses. ATT = average treatment effect on the treated. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 10. Effects of any flavor policy effect on unit sales of tobacco products, by store type

	(1) All stores	(2) Convenience stores	(3) Drug stores	(4) Grocery stores
ATT	-2465.7***	-2496.6***	-257.6*	-34.0
	(475.2)	(591.0)	(145.4)	(50.4)
No. obs.	31,105	12,364	8,032	10,709
Mean DV	28,804.2	27,140.4	2,718.1	1,760.4
ATT as % change	-8.6	-9.2	-9.5	-1.9
	[-11.8, -5.3]	[-13.5, -4.9]	[-20.0, 1.0]	[-7.5, 3.7]

Note: This table shows the effects of any local flavor policy going into effect on unit sales of tobacco products, by store type. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data are collapsed to the city-by-month level. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT as % change = the ATT expressed as a percent change relative to mean DV, with 95% CI shown in brackets.
Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 11. Effects of any flavor policy on dollar sales of non-tobacco products, by store type

	(1) All stores	(2) Convenience stores	(3) Drug stores	(4) Grocery stores
ATT	46,214	-476	-3,968	-37,739
	(79,152)	(7,026)	(2,417)	(48,963)
No. obs.	32,133	11,865	7,975	12,293
Mean DV	4,843,991.0	143,804.5	366,830.0	4,021,603.1
ATT as % change	1.0	-0.3	-1.1	-0.9
	[-2.2, 4.2]	[-9.9, 9.2]	[-2.4, 0.2]	[-3.3, 1.4]

Note: This table shows the effects of any local flavor policy going into effect on dollar sales of non-tobacco products (in dollars), by store type. Estimates are derived from two-way fixed effects models with fixed effects for city and month. Data are collapsed to the city-by-month level. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. ATT as % change = the ATT expressed as a percent change relative to mean DV, with 95% CI shown in brackets.
Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 12. Summary statistics for analysis of local no-sales of tobacco policies

	Control	Treated	Total
Mean monthly unit sales, all tobacco	21,246 (22,631)	25,932 (57,964)	22,437 (35,209)
Mean monthly unit sales, by category			
Cigarettes	12,646 (14,636)	15,899 (36,417)	13,435 (22,036)
Cigars (big, little)	3,920 (5,740)	5,388 (15,516)	4,281 (9,188)
Smokeless tobacco	2,312 (2,449)	2,026 (3,816)	2,239 (2,866)
ENDS	546 (680)	629 (1,553)	568 (991)
NRT	64 (79)	130 (262)	81 (153)
Race/ethnicity (%)			
Non-Hispanic White	46.0 (23.0)	49.9 (24.7)	47.0 (23.5)
Non-Hispanic Black	4.4 (5.4)	4.8 (7.0)	4.5 (5.8)
Asian	10.2 (12.2)	14.1 (13.2)	11.2 (12.5)
Hispanic	36.5 (22.8)	28.2 (21.9)	34.4 (22.8)
Median household income ($)	2.9 (1.3)	3.1 (1.2)	2.9 (1.3)
Population	88,364 (29,587)	111,823 (40,319)	94,246 (34,160)
Number of UPCs	4,914	3,998	5,077
Number of stores	2,284	964	3,248
Number of cities	418	110	528

Note: Standard deviations are shown in parentheses. The control group is composed of cities that do not have local flavored tobacco sales restrictions, while the treated group includes cities that have such restrictions on local flavored tobacco sales. Mean monthly unit sales refers to the monthly average of all sales that occurred from April 1, 2018, through December 31, 2022. Race/ethnicity is presented as percentages of the total population.

Appendix Table 13. Cities receiving the most weight in constructing the synthetic control for each treated city in the model of all tobacco sales

	Beverly Hills		Manhattan Beach	
Rank	City	% weight	City	% weight
1	Jamul	5.0	Imperial	13.6
2	Bonsall	3.3	Salida	9.8
3	Cloverdale	3.1	Acton	7.7
4	National City	2.4	Boron	7.6
5	Paradise	2.1	Albany	7.6
6	Aptos	2.0	Corte Madera	7.4
7	Burlingame	2.0	Woodland	7.1
8	Felton	1.9	National City	5.0
9	Richmond	1.7	Castaic	4.5
10	Winters	1.6	Freedom	4.5
11	Shasta Lake	1.6	West Sacramento	4.0
12	Magalia	1.6	Scotts Valley	3.7
13	Windsor	1.5	Burlingame	3.3
14	Pollock Pines	1.5	Marina del Rey	2.9
15	Modesto	1.5	Diamond Springs	2.4
16	Soquel	1.5	Soquel	2.2
17	Glendora	1.4	Oroville	1.4
18	Corte Madera	1.4	Winters	1.4
19	Lafayette	1.4	Calabasas	1.4
20	American Canyon	1.4	Signal Hill	0.9
21+		59.9		1.4

Note: This table shows the unit-specific weights assigned to control cities in constructing the synthetic control for each treated city for estimation of the SDID model of all tobacco sales. The last row displays the sum of weights for all other cities.

Appendix Table 14. Effect of local sales ban policies on unit sales in Beverly Hills, by tobacco and NRT product category

		By product category				
	All Tobacco	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-190.7**	-115.4***	-65.6**	-28.8	0.4	-7.7**
	(-358.4, -23.1)	(-182.3, -48.4)	(-120.0, -11.2)	(-148.1, 90.5)	(-28.3, 29.1)	(-14.3, -1.0)
No. obs.	9,025	8,949	8,683	8,512	8,854	8,702
Mean DV	285.9	202.4	71.0	6.6	44.7	151.0
ATT as % change	-66.7	-57.0	-92.4	-439.8	0.9	-5.1
	(-125.4, -8.1)	(-90.1, -23.9)	(-169.0, -15.8)	(-2262.5, 1382.9)	(-63.3, 65.1)	(-9.5, -0.7)

Note: This table shows estimates from synthetic difference-in-differences models of the change in mean units sold per store for each product category. 95% confidence intervals are provided in parentheses. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 15. Effect of local sales ban policies on unit sales in Manhattan Beach, by tobacco and NRT product category

		By product category				
	All Tobacco	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-506.1***	-154.6***	-114.9***	-333.9***	-6.6	-0.5
	(-673.7, -338.5)	(-221.5, -87.6)	(-169.3, -60.5)	(-453.2, -214.6)	(-35.3, 22.2)	(-7.2, 6.1)
No. obs.	9,025	8,949	8,683	8,512	8,854	8,702
Mean DV	776.4	264.0	120.2	459.4	48.7	2.5
ATT as % change	-65.2	-58.5	-95.6	-72.7	-13.4	-21.5
	(-86.8, -43.6)	(-83.9, -33.2)	(-140.8, -50.4)	(-98.6, -46.7)	(-72.4, 45.5)	(-286.3, 243.3)

Note: This table shows estimates from synthetic difference-in-differences models of the change in mean units sold per store for each product category. 95% confidence intervals are provided in parentheses. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 16. Effect of local sales ban policies on unit sales in Beverly Hills border area, by tobacco and NRT product category

		By product category				
	All Tobacco	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	52.0	1.0	27.4	18.3	21.4	2.0
	(-115.5, 219.6)	(-66.0, 67.9)	(-27.0, 81.8)	(-101.0, 137.6)	(-7.3, 50.1)	(-4.6, 8.7)
No. obs.	9,025	8,949	8,683	8,512	8,854	8,702
Mean DV	547.74	273.41	114.12	121.22	55.15	51.88
ATT as % change	9.5	0.4	24.0	15.1	38.8	3.9
	(-21.1, 40.1)	(-24.1, 24.8)	(-23.6, 71.6)	(-83.3, 113.5)	(-13.3, 90.8)	(-8.9, 16.7)

Note: This table shows estimates from synthetic difference-in-differences models of the change in mean units sold per store for each product category. 95% confidence intervals are provided in parentheses. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 17. Effect of local sales ban policies on unit sales in Manhattan Beach border area, by tobacco and NRT product category

		By product category				
	All Tobacco	Cigarettes	Cigars	SLT	ENDS	NRT
ATT	-54.5	2.2	9.4	-51.1	-17.3	-0.3
	(-222.0, 113.1)	(-64.7, 69.2)	(-45.0, 63.7)	(-170.4, 68.2)	(-46.0, 11.4)	(-6.9, 6.4)
No. obs.	9,025	8,949	8,683	8,512	8,854	8,702
Mean DV	627.4	277.9	157.4	177.0	59.7	22.6
ATT as % change	-8.7	0.8	5.9	-28.9	-29.0	-1.1
	(-35.4, 18.0)	(-23.3, 24.9)	(-28.6, 40.5)	(-96.3, 38.5)	(-77.1, 19.1)	(-30.5, 28.3)

Note: This table shows estimates from synthetic difference-in-differences models of the change in mean units sold per store for each product category. 95% confidence intervals are provided in parentheses. ATT = average treatment effect on the treated. Mean DV = mean dependent variable of the treated group during the pre-policy period. SLT = smokeless tobacco. Significance: * p<0.10 ** p<0.05 *** p<0.01

Appendix Table 18. Projected effect of local policies restricting the sale of flavored tobacco products on tobacco tax revenues under counterfactual scenario #1 that no cities had a local flavor policy, 2022

	Total observed revenue	Total projected revenue under scenario #1	Projected revenue change
Cigarettes	$1,437,049,797	$1,470,451,034	$33,401,236
ENDS	$91,519,090	$98,601,967	$7,082,877
SLT	$137,803,986	$145,751,362	$7,947,376
Cigars	$75,580,095	$77,571,222	$1,991,127
Total	$1,741,952,969	$1,792,375,585	$50,422,616

Note: Total observed revenues for cigarettes are drawn from publicly available CDTFA data (https://www.cdtfa.ca.gov/dataportal/dataset.htm?url=MonthlyCigaretteRevenue). Total observed revenues for SLT and cigars are estimated using CDTFA data and NielsenIQ sales data. Total observed revenues for ENDS are drawn from CDTFA data provided by special request. Counterfactual revenues are calculated by applying the difference-in-differences estimates of the impact on sales.

Appendix Table 19. Projected effect of local policies restricting the sale of flavored tobacco products on tobacco tax revenues under counterfactual scenario #2 that all cities had a local flavor policy, 2022

	Total observed revenue	Total projected revenue under scenario #2	Projected revenue change
Cigarettes	$1,437,049,797	$1,346,368,313	-$90,681,484
ENDS	$91,519,090	$73,871,924	-$17,647,166
SLT	$137,803,986	$111,957,826	-$25,846,161
Cigars	$75,580,095	$70,667,135	-$4,912,961
Total	$1,741,952,969	$1,602,865,197	-$139,087,771

Note: Total observed revenues for cigarettes are drawn from publicly available CDTFA data (https://www.cdtfa.ca.gov/dataportal/dataset.htm?url=MonthlyCigaretteRevenue). Total observed revenues for SLT and cigars are estimated using CDTFA data and NielsenIQ sales data. Total observed revenues for ENDS are drawn from CDTFA data provided by special request. Counterfactual revenues are calculated by applying the difference-in-differences estimates of the impact on sales.

Appendix Table 20. Comparing the effect of the statewide flavor policy based on observed tax revenues and the effect based on projected revenues under counterfactual scenario #2

	Total observed revenue, 2023	Total projected revenue under scenario #2, 2022	Projected revenue change (Observed 2023 – scenario #2)	Actual revenue change after Y1 of SB 793 (Observed 2023 – Observed 2022)
Cigarettes	$1,242,202,965	$1,346,368,313	-$104,165,349	-$194,846,833
ENDS	$37,443,868	$73,871,924	-$36,428,056	-$54,075,222
Subtotal	$1,279,646,833	$1,420,240,237	-$140,593,404	-$248,922,054

Note: This table shows the observed and projected change in tax revenues from 2022 and 2023. The third column shows the change between observed 2023 revenues and projected 2022 revenues under Scenario #2. The last column shows the change in observed 2023 revenues and observed 2022 revenues. Sources to estimate observed tax revenue data for smokeless tobacco and cigars in 2023 were available.

Appendix Table 21. Projected change in tobacco tax revenue distribution for Prop 99 programs under counterfactual scenarios involving local flavor policies, 2022

	Projected revenue change for Prop 99 programs under scenario #1	Projected revenue change for Prop 99 programs under scenario #2
Cigarettes	$2,909,515	-$7,899,084
ENDS	$616,975	-$1,537,210
SLT	$692,280	-$2,251,408
Cigars	$173,443	-$427,958
Total	$4,392,214	-$12,115,660

Appendix Table 22. Projected change in tobacco tax revenue distribution for Prop 56 programs under counterfactual scenarios involving local flavor policies, 2022

	Projected revenue change for Prop 56 programs under scenario #1	Projected revenue change for Prop 56 programs under scenario #2
All tobacco tax revenues	$33,339,803	-$92,445,741
DHCS	$27,338,638	-$75,805,508
CDPH/CTPP	$3,684,048	-$10,215,254
CDE	$650,126	-$1,802,692
TRDRP	$1,666,990	-$4,622,287
Tax revenues by product type		
Cigarette tax revenues	$23,276,123	-$63,192,672
DHCS	$19,086,421	-51,817,991
CDPH/CTPP	$2,572,012	-6,982,790
CDE	$453,884	-1,232,257
TRDRP	$1,163,806	-3,159,634
ENDS tax revenues	$3,137,894	-$7,818,142
DHCS	$2,573,073	-$6,410,877
CDPH/CTPP	$346,737	-$863,905
CDE	$61,189	-$152,454
TRDRP	$156,895	-$390,907
SLT revenues	$5,538,241	-$18,011,262
DHCS	$4,541,358	-$14,769,235
CDPH/CTPP	$611,976	-$1,990,244
CDE	$107,996	-$351,220
TRDRP	$276,912	-$900,563
Cigar tax revenues	$1,387,545	-$3,423,666
DHCS	$1,137,787	-$2,807,406
CDPH/CTPP	$153,324	-$378,315
CDE	$27,057	-$66,761
TRDRP	$69,377	-$171,183

Appendix Table 23. Projected effect of local no sale of tobacco policies on tobacco tax revenues under counterfactual scenario #1 that no cities had a no-sales policy, 2022

	Total observed revenue	Total projected revenue under scenario #1	Projected revenue change
Cigarettes	$1,437,049,797	$1,438,368,113	$1,318,316
ENDS	$91,519,090	$92,299,463	$780,373
SLT	$137,803,986	$137,980,731	$176,745
Cigars	$75,580,095	$75,626,341	$46,246
Total	$1,741,952,969	$1,744,274,648	$2,321,679

Note: Total observed revenues for cigarettes are drawn from publicly available CDTFA data (https://www.cdtfa.ca.gov/dataportal/dataset.htm?url=MonthlyCigaretteRevenue). Total observed revenues for SLT and cigars are estimated using CDTFA data and NielsenIQ sales data. Total observed revenues for ENDS are drawn from CDTFA data provided by special request. Counterfactual revenues are calculated by applying the difference-in-differences estimates of the impact on sales..

Appendix Table 24. Projected effect of local no sale of tobacco policies on tobacco tax revenues under counterfactual scenario #2 that all cities had a no-sales policy, 2022

	Total observed revenue	Total projected revenue under scenario #2	Projected revenue change
Cigarettes	$1,437,049,797	$0	-$1,437,049,797
ENDS	$91,519,090	$0	-$91,519,090
SLT	$137,803,986	$0	-$137,803,986
Cigars	$75,580,095	$0	-$75,580,095
Total	$1,741,952,969	$0	-$1,741,952,969

Note: Total observed revenues for cigarettes are drawn from publicly available CDTFA data (https://www.cdtfa.ca.gov/dataportal/dataset.htm?url=MonthlyCigaretteRevenue). Total observed revenues for SLT and cigars are estimated using CDTFA data and NielsenIQ sales data. Total observed revenues for ENDS are drawn from CDTFA data provided by special request. Counterfactual revenues are calculated by applying the difference-in-differences estimates of the impact on sales.

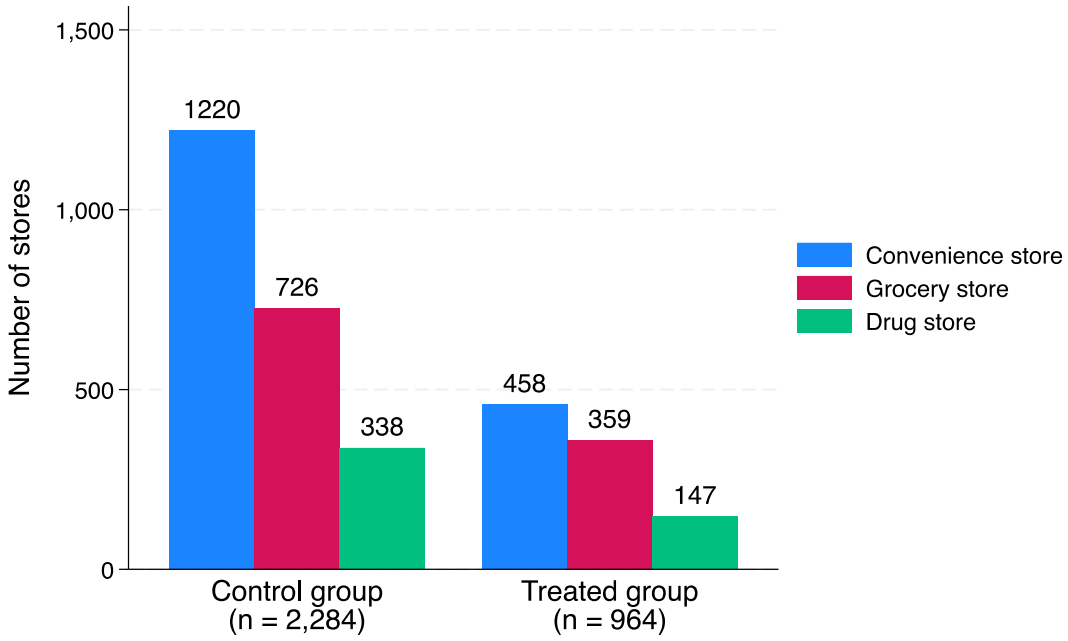
Appendix Table 25. Projected change in tobacco tax revenue distribution for Prop 99 programs under counterfactual scenarios involving local no-sales policies, 2022

	Projected revenue change for Prop 56 programs under scenario #1	Projected revenue change for Prop 56 programs under scenario #2
Cigarettes	$114,836	-$125,178,554
ENDS	$67,977	-$7,972,046
Cigars	$4,028	-$6,583,632
SLT	$15,396	-$12,003,832
Total	$202,237	-$151,738,063

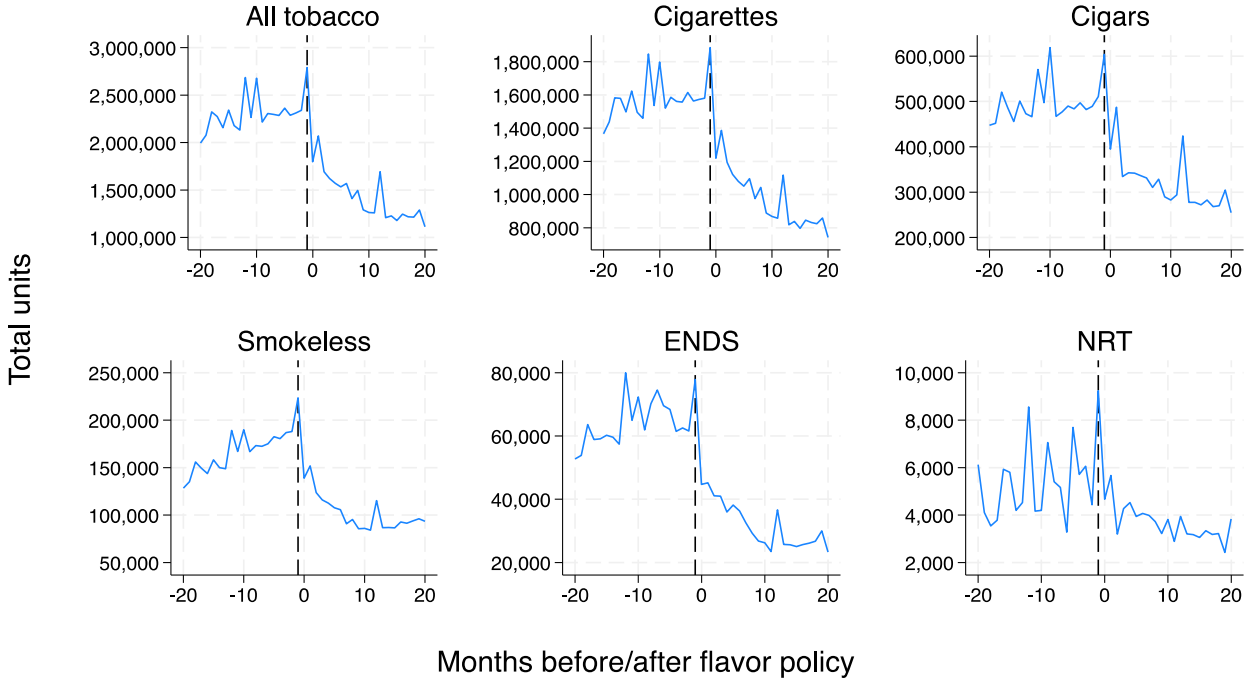
Appendix Table 26. Projected change in tobacco tax revenue distribution for Prop 56 programs under counterfactual scenarios involving local no-sales policies, 2022

	Projected revenue change for Prop 56 programs under scenario #1	Projected revenue change for Prop 56 programs under scenario #2
All tobacco tax revenues	$1,090,076	-$1,190,673,416
DHCS	$893,862	-$976,352,201
CDPH/CTPP	$120,453	-$131,569,412
CDE	$21,256	-$23,218,132
TRDRP	$54,504	-$59,533,671
Tax revenues by product type		
Cigarette tax revenues	$918,687	-$1,001,428,430
DHCS	$753,323	-821,171,313
CDPH/CTPP	$101,515	-110,657,842
CDE	$17,914	-19,527,854
TRDRP	$45,934	-50,071,422
ENDS tax revenues	$15,995	-$40,545,277
DHCS	$13,116	-$33,247,127
CDPH/CTPP	$1,767	-$4,480,253
CDE	$312	-$790,633
TRDRP	$800	-$2,027,264
SLT revenues	$123,167	-$96,030,652
DHCS	$100,997	-$78,745,135
CDPH/CTPP	$13,610	-$10,611,387
CDE	$2,402	-$1,872,598
TRDRP	$6,158	-$4,801,533
Cigar tax revenues	$32,227	-$52,669,056
DHCS	$26,426	-$43,188,626
CDPH/CTPP	$3,561	-$5,819,931
CDE	$628	-$1,027,047
TRDRP	$1,611	-$2,633,453

Appendix Figure 1. Count of stores used in the local flavor policy analysis

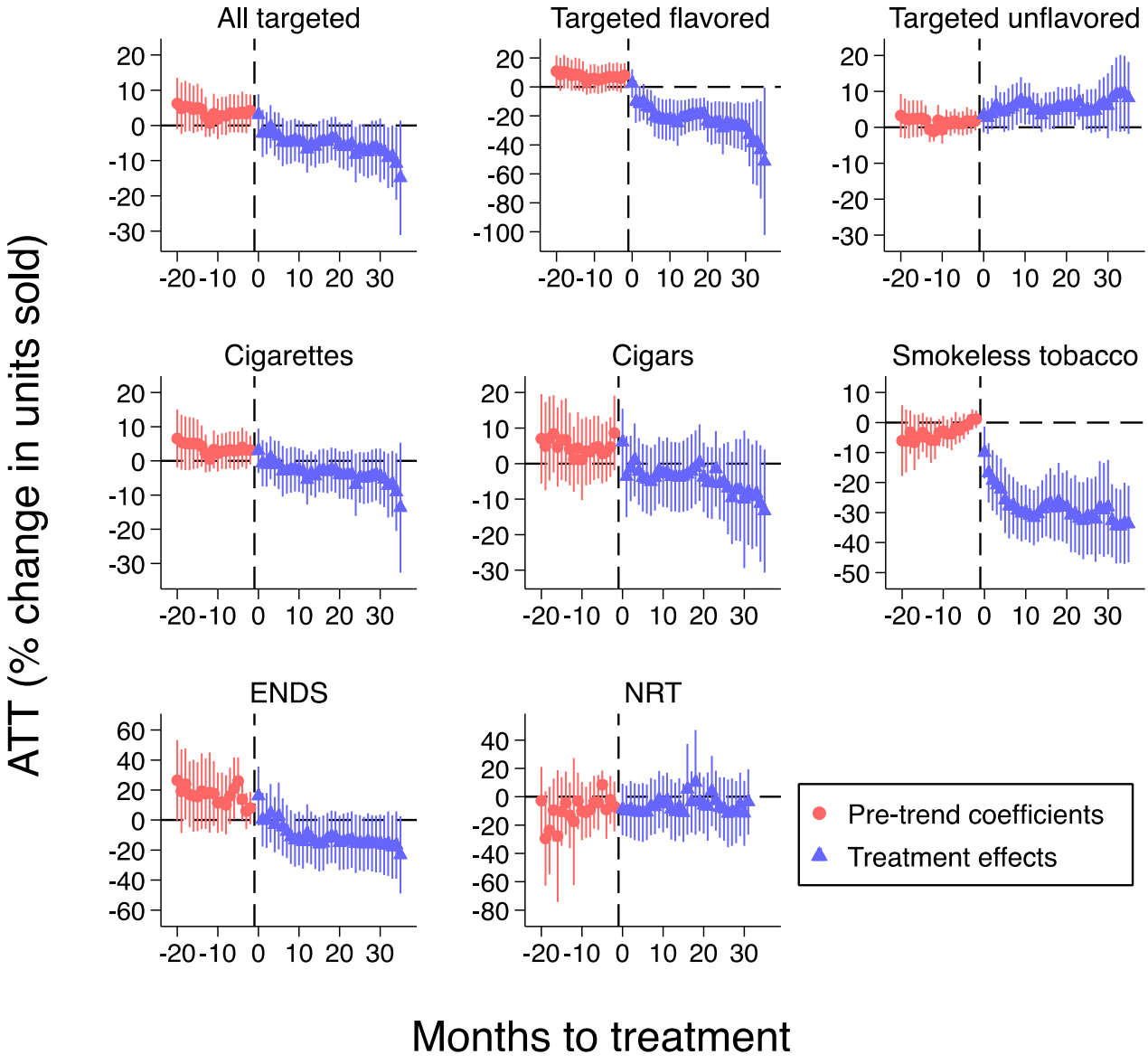


Appendix Figure 2. Trend in unit sales of tobacco and NRT products in treated cities, by month



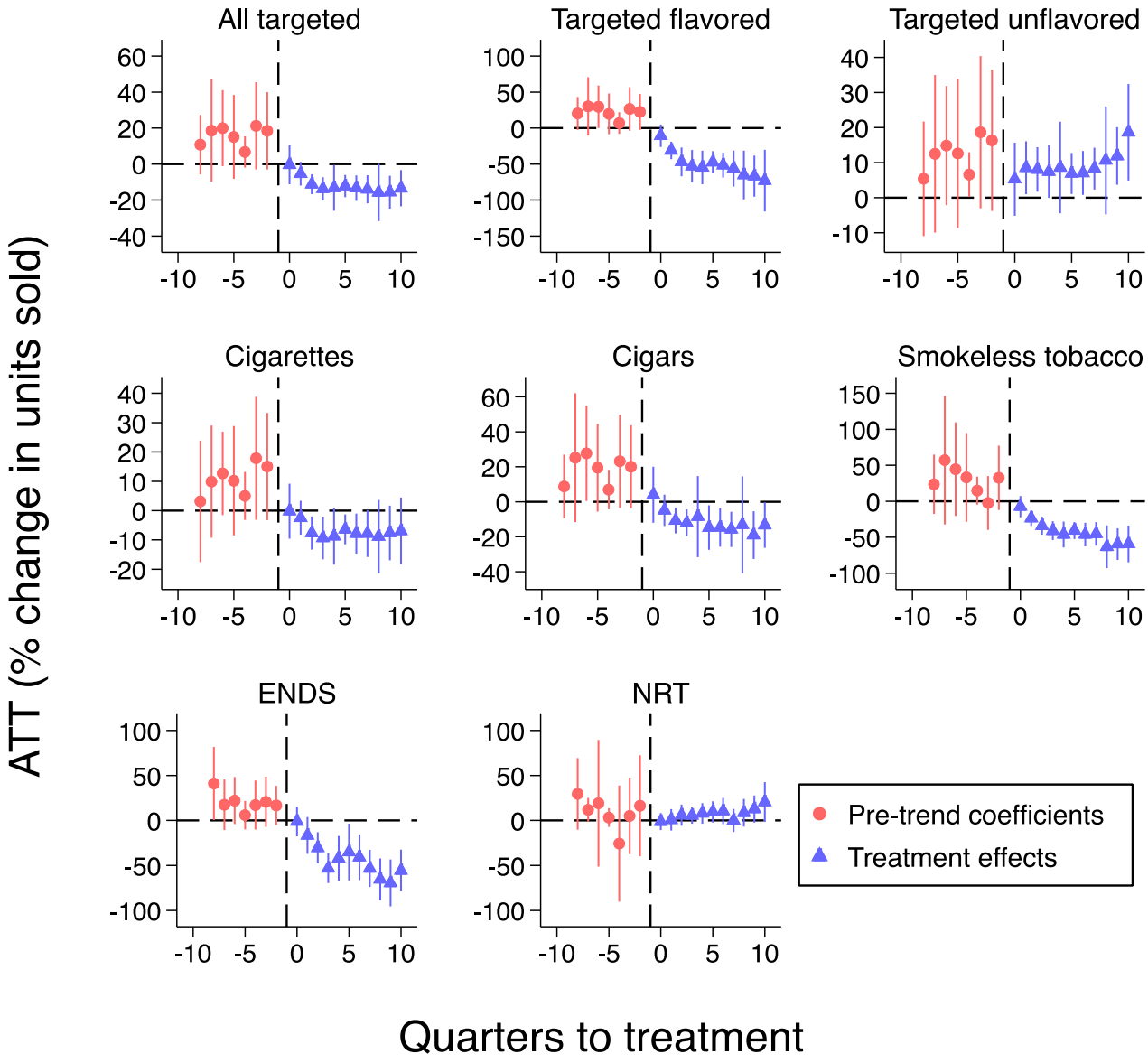
Note: This figure shows trends in unit sales of tobacco and NRT products over time among cities that had a local flavor sales restriction policy in effect. Time is rescaled to be zero in the month of policy's effective date.

Appendix Figure 3. Two-way fixed effects estimation of the percent change in unit sales over time due to any local flavor policy going into effect



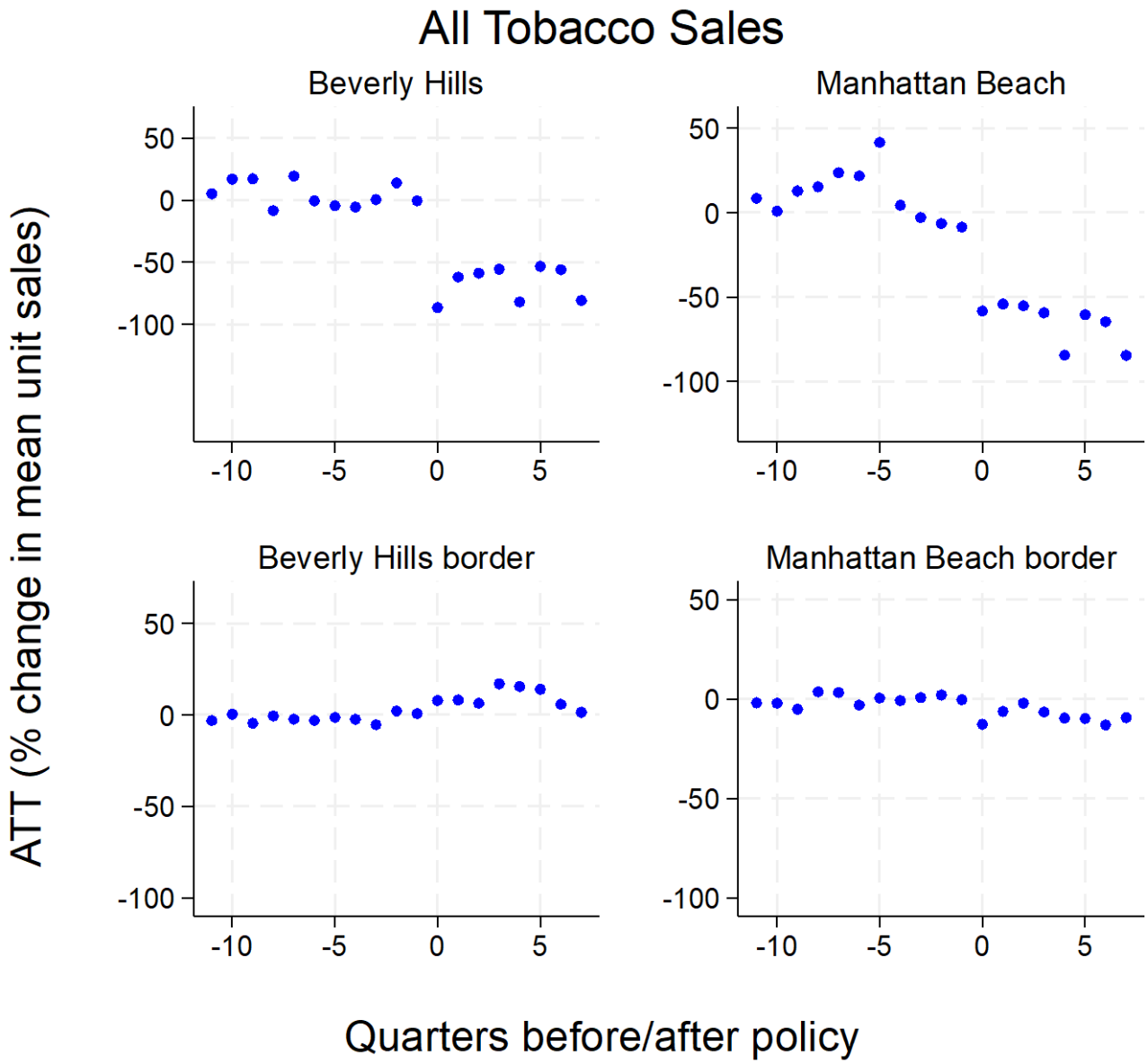
Note: This figure displays event-study coefficients and 95% confidence intervals for the effects of any local flavor policy going into effect. The vertical axis displays the average treatment effect on the treated (ATT), representing the difference in units sold between cities with a local flavor policy (treated group) and cities without (control group), scaled as a percentage change compared with the units sold in the month prior to a policy's effective date. Estimates are derived from event-study difference-in-differences models that include city and month-year fixed effects.

Appendix Figure 4. Callaway-Sant'Anna estimation of the percent change in quarterly unit sales over time due to any local flavor policy going into effect



Note: This figure shows event-study coefficients and 95% confidence intervals for the effects of any local flavor policy going into effect. The vertical axis displays the average treatment effect on the treated (ATT), representing the difference in units sold between cities with a local flavor policy (treated group) and cities without (control group), scaled as a percentage change compared with the units sold in the month prior to a policy's effective date. Estimates are derived from Callaway-Sant'Anna difference-in-differences models using doubly-robust estimation adjusting for the city population, mean household income, percent Hispanic, percent non-Hispanic Black, percent non-Hispanic White, percent non-Hispanic Asian, and percent "other" race/ethnicity.

Appendix Figure 5. Change over time in the effects of a local no-sales policy on quarterly unit sales of all tobacco products in treated and border areas



Note: This figure displays event-study coefficients and 95% confidence intervals for the effects of a local no-sales of tobacco policy going into effect. The vertical axis displays the average treatment effect on the treated (ATT), representing the difference in units sold between cities with a no-sales policy (treated group) and cities without (control group), expressed as a percent change relative to the outcome in the pre-policy period. Estimates are derived from synthetic difference-in-differences models that include geographic and quarter-year fixed effects. Data were analyzed at the city-quarter level and included a sample of convenience, grocery, and drug stores.