The Effects of Tobacco Flavor Restrictions on Tobacco Retail Businesses in Massachusetts and States in the Northeast Region of The United States

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Key Takeaways

Background

- In June 2020, Massachusetts became the first state in the United States to restrict the sale of all flavored tobacco products, including menthol cigarettes.
- The Massachusetts Tobacco Cessation and Prevention Program (MTCP) conducted a comprehensive evaluation of the impact of the policy on tobacco use, access, and cessation.
- As part of this evaluation MTCP collaborated with economists John Tauras, Ph.D. and Frank Chaloupka, Ph.D. at the University of Illinois Chicago ("economists") to examine the impact of the policy on the retail environment and health care costs.

Impact on the Retail Environment

- Using data from 2014 to 2023, economists examined the effects of restrictions on the sales of flavored cigarettes and vape products for all states in the Northeast Region of the United States (Massachusetts, Maine, Connecticut, New Hampshire, Rhode Island, Vermont, New Jersey, New York, Pennsylvania). They examined the effects on:
    - the number of tobacco stores, convenience stores, and convenience stores with gas stations,
    - the number of employees working in these stores, and
    - the inflation-adjusted average weekly wages paid to employees.
- After adjusting for per-capita income; geographic region; COVID restrictions; seasonality, and trends in establishments; employees; and wages over time, results from statistical models showed no evidence that flavored tobacco sales restrictions have a negative effect on:
    - the number of stores that sell tobacco products,
    - the number of employees, and
    - the wages paid to employees.
- This finding is consistent with previous research[1,2].

Limitations

- Data was not available to assess the impact of flavored tobacco restrictions on additional business performance indicators such as sales revenue, net income, profit margins, or customer retention rates.
- Analyses were not inclusive of all types of tobacco retailers, such as vape shops or online retailers.

1. "The Economic Effects of Cigarette Sales and Flavor Bans on Tobacco Retail Businesses" examined the impact of flavored tobacco restrictions on trends in the number of stores, number of employees, and wages paid to employees, in Massachusetts and neighboring states from 2018-2021: Tauras, J.A. & Chaloupka, F.J. (2023). The Economic Effects of Cigarette Sales and Flavor Bans on Tobacco Retail Businesses. Tobacconomics.
2. "The Effects of Tobacco Flavor Restrictions on Tobacco Retail Businesses" examined the impact of flavored tobacco restrictions on the number of stores, number of employees, and wages paid to employees in all US states from 2017-2022: Tauras et al. (2023). The Effects of Tobacco Flavor Restrictions on Tobacco Retail Businesses. Tobacconomics.

Introduction

The federal government, several states, and many localities have enacted policies restricting the sale of flavored tobacco products. In 2009, as part of the United States (US) Family Smoking Prevention and Tobacco Control Act, Congress banned characterizing flavors in combustible cigarettes. The only exception to the flavor ban was the menthol flavor. In February 2020, the Food and Drug Administration (FDA) prioritized enforcement against flavored cartridge/pod-based e-cigarette products. The only exceptions for the cartridge/pod-based e-cigarette flavor ban were for menthol and tobacco flavors. The FDA prioritized enforcement exempted flavored disposable e-cigarettes and e-liquid products (FDA, 2020).

Currently, seven states restrict the sale of flavored tobacco products (FTPs). Four of these states are in the Northeast Region of the US including: Massachusetts, New Jersey, New York, and Rhode Island. In 2019, Massachusetts became the first state in the US to restrict the sale of all flavored tobacco products - including menthol cigarettes and flavored e-cigarettes. The only exception to the Massachusetts law is that FTPs can still be sold at licensed smoking bars where consumption must occur on-site. In 2020, New Jersey, New York, and Rhode Island enacted restrictions on the sale of flavored e-cigarettes.

Numerous localities throughout the US have restricted the sale of flavored tobacco products. According to the Truth Initiative, as of March 31, 2024, fifteen states had at least one

local level jurisdiction that had enacted a flavored tobacco sales restriction (Truth Initiative, 2024). As of March 31, 2024, 398 counties, cities, towns, and villages in the US had placed some type of restriction on the sale of flavored tobacco products, and of those, 127 had fully comprehensive policies that prohibit sales of all types of flavors across all products, including menthol/mint/wintergreen tobacco products, at all retailers. According to the Truth Initiative, from January 1, 2024 to March 31, 2024, approximately 28.48% of the U.S. population was living in a jurisdiction with a flavored tobacco sales restriction in effect, and over the same period, 3.23% of the US population was covered by a fully comprehensive flavored tobacco sales restriction where the sale of all tobacco products in a jurisdiction were restricted including all flavors, all products, and all retailers.

Opponents of FTP sales restrictions argue that these policies harm retailers who sell tobacco products. Claims of adverse economic impacts to businesses have been made about a variety of tobacco control policies that affect the demand for tobacco products. A review of the literature from methodologically sound studies contradicts this claim, concluding that measures that affect the demand for tobacco products have either no negative economic impact or, in many cases, have positive economic effects (NCI/WHO, 2016).

Effects of the Massachusetts Tobacco Flavor Policy on Cigarette Sales & Smoking

Several recent studies have examined the impact of the Massachusetts flavor ban on cigarette sales and smoking in Massachusetts. A study by Asare and colleagues (2021) found that after the flavor ban was enacted, the adjusted 4-week sales of cigarettes in Massachusetts compared to the control states decreased by 372.27 packs per 1000 people for menthol

cigarettes but increased by 120.25 packs per 1000 people for non-flavored cigarettes. Overall, the adjusted 4-week sales of all cigarettes in Massachusetts compared to the control states decreased by 282.65 packs per 1000 people. A follow-up study by Asare and colleagues (2022) found that following the implementation of the Massachusetts flavor ban, compared with comparison states, monthly cigarette sales per 1,000 persons decreased in Massachusetts by 350.02 packs and increased in bordering states by 9.51 packs per 1000 persons, yielding a net decrease of 340.51 packs per 1,000 persons in Massachusetts and neighboring states combined. This translates into total monthly cigarette sales declines of 2.45 million packs in Massachusetts and an increase of 0.13 million packs in bordering states, resulting in a net decrease of 2.32 million packs in Massachusetts and neighboring states. A study published by the Massachusetts Tobacco Cessation and Prevention Program (Kingsley et al., 2022) found that in the year after the Massachusetts flavor ban went into effect, overall tobacco sales in Massachusetts decreased by 25.4% as compared with the previous year. The study found total sales of tobacco products in NH, NY, RI, and VT decreased by 1.8% in the year after the Massachusetts ban was enacted compared with the previous year. A recent study by Tauras and Chaloupka (2024) found that the Massachusetts ban on flavored cigarette sales had a negative and significant impact on smoking prevalence rates in Massachusetts and yielded significant benefits for public health.

Simulations indicated that restrictions on flavored cigarettes alone, namely menthol, reduced smoking prevalence in Massachusetts by 1.372% between the period when the law went into effect and January 2023. The largest effect of the law was right after the law went into effect with smoking prevalence declining 0.885% between 2020 and 2021.

The reductions in smoking prevalence led to direct healthcare cost savings (inclusive of inpatient and outpatient services, and prescription drugs) and on savings in medical expenditure to patients (aggregated across payer type). Some of these cost savings include Medicaid cost savings on smoking attributable conditions (cancer, emphysema, arteriosclerosis, heart attack, stroke), and healthcare cost savings due to reductions in individual conditions such as lung cancer, heart attack and stroke, and smoking-related birth/pregnancy complications and related health care costs for their children in their first year of life.

The one-year, five-year, and ten-year cost savings associated with birth/pregnancy complications, heart attacks and strokes, and lung cancers are $4.8 million, $71.3 million, and $198 million, respectively. The one-year, five-year, and ten-year state share of Medicaid costs savings attributed to the Massachusetts menthol cigarette restriction are estimated to be $1.1 million, $15.77 million, and $43.2 million, respectively.

Effects of Flavored Tobacco Restrictions on Businesses

Despite claims that FTP sales restrictions cause retailers to go out of business and employees to lose their jobs, there is very little scientific evidence on this topic. A report by Tauras and colleagues (2023) used multivariate regression techniques and found no evidence that flavored e-cigarette or menthol cigarette sales restrictions had negative effects on tobacco stores, convenience stores, or convenience stores with gas stations in the United States as a whole. Tauras and Chaloupka (2023) used graphical analysis to examine trends in employment, wages, and number of establishments in Massachusetts and states that border Massachusetts including New Hampshire, Vermont, Rhode Island, Connecticut, and New York for the period

first quarter 2018 through the fourth quarter 2021. The trend analyses demonstrated that tobacco flavor bans did not adversely affect convenience stores, gas stations with convenient stores, or tobacco stores.

This report provides the first evidence on the relationship between FTP sales restrictions and several measures of tobacco store, convenience store, and convenience store with gas station business in Massachusetts and states in the Northeast Region of the United States using multivariate regression analyses.[1] Specifically, this report examines the effects of e-cigarette and combustible cigarette FTP sales restrictions on the number of establishments, number of employees, and inflation adjusted average weekly wages paid to employees working in tobacco stores[2], convenience stores, and convenience stores with gas stations.

Methods

State-level quarterly data on tobacco stores, convenience stores, and convenience stores with gas stations were extracted from the US Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) for the first quarter 2014 through the fourth quarter 2021.[3] State-level quarterly data on convenience stores with gas stations were also extracted

[1] We utilize the United States Census definition of the Northeast Region. This region includes the Mid Atlantic Division of states including New York, New Jersey, and Pennsylvania as well as the New England division of states including Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

[2] Tobacco stores (NAICS 453991) are defined as establishments primarily engaged in retailing cigarettes, cigars, tobacco, pipes, and other smokers' supplies. The corresponding index entries for NAICS 453991 are tobacco stores, smokers' supply stores, cigarette stands (permanent), and cigar stores.

[3] Data on convenience stores and tobacco stores for 2022 were not included in this study. Convenience stores went through an NAICS number change from 445120 to 445131 in 2022. Although the description of both NAICS numbers representing convenience stores is the same, the change in NAICS number represents a "DIRECT+ classification change" in 2022. This implies that all establishments in 2017 NAICS 445120 will transfer directly into 2022 NAICS 445131, but the 2022 NAICS 445131 adds additional establishments beyond the 2017 NAICS 445120. Likewise, tobacco stores went through an NAICS number change from 453991 to 459991 in 2022. This was also a “Direct+” change. Therefore the 2022 data for convenience stores and tobacco stores is not compatible with data prior to 2022 and thus the 2022 data on convenience stores and tobacco stores is not used in the analyses.

from the US BLS QCEW for the first quarter 2014 through the third quarter 2023.[4] Using the QCEW, we created nine separate dependent variables. Three dependent variables were defined for the number of establishments for each type of business: tobacco stores, convenience stores, and convenience stores with gas stations. The next three dependent variables were defined for the number of employees working in each type of business: tobacco stores, convenience stores, and convenience stores with gas stations. The final three dependent variables were defined for the average inflation adjusted wages employees earned (in 2023 Quarter 1 dollars) in each type of business: tobacco stores, convenience stores, and convenience stores with gas stations.

Flavored Tobacco Restriction Policies

We merged state-level quarterly cigarette and e-cigarette flavor sales restrictions with the QCEW data for all states in the Northeast Region of the US. Specifically, we merged four different measures of FTP sales restrictions with the QCEW data: percent of each state's population covered by any flavored e-cigarette restriction; percent of each state's population covered by any combustible menthol cigarette restriction; a state-level flavored e-cigarette restriction index, and a state-level menthol cigarette restriction index. The derivation of these four state-level variables is defined in the next section below.

[4] Convenience stores with gas stations went through an NAICS number change from 447110 to 457110 in 2022. However, the change in NAICS number for convenience stores with gas stations represents a "DIRECT" change where the industry received a new numeric code, but kept the same exact definition. Therefore the 2022-2023 data on convenience stores with gas stations is compatible with prior years data and is included in the analyses.

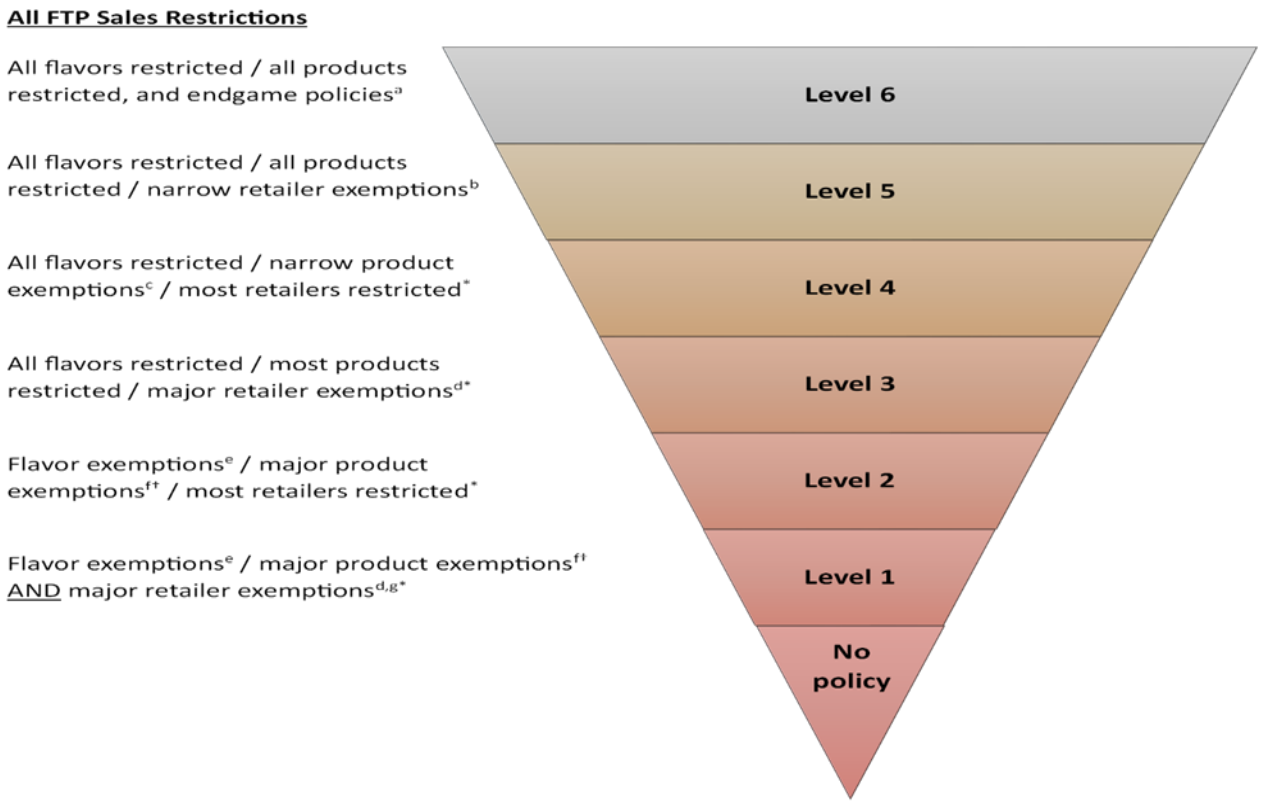
The FTP sales restriction data came from a database maintained by Truth Initiative that tracks local and state FTP sales restrictions in the US.[5] FTP laws for this database are retrieved from news and media outlets, and text from online sources such as municipal codes and state statutes (Donovan, et al., 2021). The Truth Initiative database utilized more than 470 laws implemented from January 2009 to March 31, 2024, from the 50 US States and the District of Columbia.

Flavored Tobacco Restriction Policies Comprehensive Classification Schema

To properly capture nuance in flavored tobacco sales restriction policies, we used the classification scheme developed by Donovan and colleagues (Donovan et al., 2021). This six-level classification scheme grades the comprehensiveness of all FTP restrictions passed at the local and state level, with level 1 being the least comprehensive and level 6 being the most comprehensive. This system grades FTP restrictions based on three criteria: flavor restrictions, product restrictions, and retailer restrictions (see Figure 1 below). The classification schema was integrated as a variable in the FTP Restrictions Database and was presented as a numerical value (1-6) denoting the comprehensiveness of the policy. Localities with no policies were given a value of zero. Table 1 provides the percent of US Population Covered by FTP sales restrictions for any tobacco product by comprehensiveness level, as of March 31, 2024. As can be seen in Table 1, 28.48% of the US population was covered by any FTP sales restrictions. Specifically, 1.08%, 11.19%, 1.3%, 8.15%, 3.55%, and 3.23% of the US population was covered by comprehensiveness levels 1, 2, 3, 4, 5, and 6, respectively.

[5] A detailed description of the database is located at: Flavored Tobacco Policy Resources

Figure 1



"Final classification scheme for all FTP sales restrictions (including e-cigarette-only restrictions) and e-cigarette-only sales restrictions. [a]Endgame policies refer to restrictions on the sale of all tobacco products. [b]Narrow retail exemptions allow for the sale of FTPs in on-site consumption tobacco or smoking bars (ie, retailers exclusively occupying an enclosed indoor space and are primarily selling tobacco products for consumption by customers on the premises). [c]Narrow product exemptions allow for the sale of flavoured: hookah, pipe, premium cigars, FDA premarket approval products, and/or FDA modified risk approval products. [d]Major retailer exemptions allow for the sale of FTPs in: adult-only retailers, liquor stores, vape shops, specialty stores (i.e., establishments in which the primary purpose is the sale of tobacco and tobacco-related products and/or a specified percentage of its revenues is derived from the sale of tobacco and tobacco-related products), and/or policies that apply only to buffer zones (i.e., policies that apply only to retailers within a certain distance of youth-oriented areas, such as schools, parks, playgrounds and libraries). [e]Flavour exemptions allow for the sale of FTPs with menthol flavour or characterising flavors. [f]Major product exemptions allow for the sale of flavoured: e-cigarettes, cigars, LCCs, SLT, and/or roll-your-own tobacco. [g]Includes FTP policies with missing data for any flavour, product, or retailer exemption and/or FTP policies that exempt existing retailers...*Narrow retailer exemptions may also be present. †Narrow product exemptions may also be present..." The diagram and footnotes are from Donovan and colleagues.[1]

Table 1

Percent of US Population Covered by FTP sales restrictions for any product by comprehensiveness level, as of March 31, 2024.

Name	No Policy (%)	Comprehensiveness Level 1	Comprehensiveness Level 2	Comprehensiveness Level 3	Comprehensiveness Level 4	Comprehensiveness Level 5	Comprehensiveness Level 6	Any Level (1-6) (%)
United States	71.52%	1.08%	11.19%	1.3%	8.15%	3.55%	3.23%	28.48%

The Truth Initiative accounted for the number of days a law was in effect for any given year-quarter period (0-1) and multiplied this variable by the population estimate of each locality and comprehensiveness level by product. They considered certain law characteristics (e.g., effective date, expiration date, county jurisdiction) and calculated the population estimate covered by FTP sales restrictions at the local, county, and state level. Percentage of the population covered by an FTP sales restriction were calculated for each comprehensive level (0-6) by dividing the total number of people in the state covered by FTP sales restrictions by the total state population for that year (Equation 1). For more information on methodology please see forthcoming paper by Donovan et al., 2024.

$$\sum_{i=1}^{6} \%Population\ Covered\ by\ FTP_{iSYQP} = \frac{\left(Total\ Population\ Covered\ by\ FTP\ restrictions_{iSYQP}\right)}{\left(Total\ Population_{iSYQ}\right)} \quad (1)^{1}$$

In our regression analyses, we used four different measures of FTP sales restrictions: percent of the population covered by any flavored e-cigarette restriction; percent of the population covered by any combustible menthol cigarette restriction; a flavored e-cigarette restriction index, and a menthol cigarette restriction index. The flavored e-cigarette and menthol cigarette restriction indices place more weight on the higher comprehensiveness levels of flavor restrictions. For example, a weight of 1 is applied to FTP comprehensiveness level 1, a weight of 2 is applied to FTP comprehensiveness level 2, a weight of 3 is applied to FTP comprehensiveness level 3, and so forth. Specifically, the e-cigarette flavor restriction index is defined as follows:

E-cigarette flavor restriction index = (1**Percent of population in e-cig FTP level* 1 + 2* *Percent of population in e-cig FTP level 2* + 3* *Percent of population in e-cig FTP level 3* + 4* *Percent of population in e-cig FTP level 4* + 5* *Percent of population in e-cig FTP level 5* + 6* *Percent of population in e-cig FTP level* 6) (2)

The menthol cigarette restriction index is defined as follows:

Menthol cigarette flavor restriction index = (1**Percent of population in cig FTP level* 1 + 2* *Percent of population in cig FTP level 2* + 3* *Percent of population in cig FTP level 3* + 4* *Percent of population in cig FTP level 4* + 5* *Percent of population in cig FTP level 5* + 6* *Percent of population in cig FTP level* 6) (3)

We also merged a measure of quarterly inflation-adjusted state per capita income with the QCEW data to control for overall quarterly state-level economic conditions. Quarterly per-capita income by state was acquired from the Bureau of Economic Analysis - US Department of Commerce and was adjusted for inflation using the consumer price index (in 2023 first quarter dollars). Moreover, to control for the effects of the COVID 19 epidemic we created a variable that captures the number of days in each quarter where each state declared an emergency stay at home order due to the COVID19 pandemic. Finally, we created two dichotomous indicators for US Census Divisions. The New England Census Division indicator took on a value of one if the state was Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, or Vermont, and it took on a value of zero otherwise. The Mid Atlantic Census Division indicator took on a value of one if the state was New York, New Jersey, or Pennsylvania, and it took on a value of zero otherwise.

Statistical Methods

We used ordinary least squares regressions to estimate all the equations. We employed a three-way fixed-effects regression technique that controls for year-specific, census division-specific,[6] and quarter-specific determinants of business activity. This type of fixed effects approach amounts to including a dichotomous indicator for the Mid Atlantic Division (the New

[6] We tried to estimate models using state fixed effects rather than Census division fixed effects. There was a high degree of collinearity between the FTP policy variables and the state fixed effects in the models.

England division was omitted as the comparison division), each year (except 2014 which is omitted as the comparison year) and each quarter (except quarter 1 which is omitted as the comparison quarter) as explanatory variables in the models. The three-way fixed-effects regression technique controls for time-invariant unobserved Census division-level heterogeneity (through the division indicator), changes in the business activity over time (through the use of dichotomous year indicators), and seasonality (through the use of dichotomous quarterly indicators). Finally, we cluster corrected the standard errors at state level in all the equations.

Table 1 presents the regression equations where the dependent variables are the number of convenience stores (Model 1), the number of convenience stores with gas stations (Model 2), and the number of tobacco stores (Model 3). The independent variables in models 1-3 are the percent of the population covered by any flavored e-cigarette restriction, the percent of the population covered by any flavored cigarette restriction, COVID 19 stay at home orders, inflation adjusted per-capita income, Census division fixed effects, year fixed effects, and quarter fixed effects.

Table 2 is identical to Table 1, except the dependent variables in Tables 2 are the number of employees working in: convenience stores, convenience stores with gas stations, and tobacco stores. Table 3 is identical to Table 1, except the dependent variables in Tables 3 are the inflation adjusted wages paid to workers in: convenience stores, convenience stores with gas stations, and tobacco stores. Finally, Tables 4-6 are identical to Tables 1-3 except in Tables 4-6 the flavor restrictions index for e-cigarettes replaces the percent of the population

covered by any e-cigarette flavor restriction and the flavor restrictions index for cigarettes replaces the percent of the population covered by any cigarette flavor restriction.

Results

Our investigations revealed no evidence that restrictions on the sale of flavored e-cigarettes or cigarettes had adverse effects on businesses that sell tobacco products. In all the regressions that were estimated there wasn't a significant negative association between the percent of the population covered by an FTP policy on the number of stores, employees, or wages paid to employees, even after adjusting for per-capita income, geographic region, COVID restrictions, seasonality, and trends in establishments, employees, and wages over time. The estimates indicate that convenience stores, gas stations with convenience stores, and tobacco stores successfully adapt to changes in market conditions, including the implementation of flavor bans on tobacco products.

Several other interesting findings emerge from the regressions. Controlling for other covariates, Mid-Atlantic states have a significantly higher number of convenience stores and convenience store employees, convenience stores with gas stations and convenience stores with gas station employees, and tobacco stores and tobacco store employees than New England states. Inflation adjusted state per-capita income is found to have a positive and significant effect on the number of convenience store establishments and the real wages paid to employees of convenience stores with gas stations. Inflation adjusted tobacco store wages were significantly higher in years 2016-2021 than in 2014. Tobacco store establishments and employment were significantly higher in 2016-2019 than in 2014. Finally, COVID 19 stay at home orders were found not to have a significant effect on establishments that sell tobacco

products with one exception – COVID 19 stay at home orders were found to have a negative and significant effect on inflation adjusted wages paid to convenience store with gas station employees.

Conclusion

Opponents of FTP sales restrictions state that these types of policies harm businesses that sell tobacco products. In this report we examined the effects of flavored tobacco sales restrictions on the number of establishments, number of employees, and real average wages paid to employees working in convenience stores, convenience stores with gas stations, and tobacco stores in Massachusetts and other states in the Northeast region of the US. Using multivariate regression analyses, we find no evidence that flavored tobacco sales restrictions have a negative effect on businesses that sell tobacco products. This finding is consistent with the work of Tauras and colleagues (2023) and Tauras and Chaloupka (2023) who found no effects of FTP restrictions on businesses that sell tobacco.

This research has many strengths, but it is not without limitations. First, while we were able to examine the effects of flavored tobacco restrictions on the number of establishments employees, and wages of employees, we were unable to examine the effects of flavored tobacco restrictions on other key performance indicators for these businesses such as sales revenues, net income, profit margins, and even customer retention rates as these data are not publicly available. Second, while tobacco stores, convenience stores, and convenience stores with gas stations sell vaping products, we were unable to examine the effects of flavored tobacco restrictions on independent vape stores as these stores were classified under NAICS 453998 “All Other Miscellaneous Store Retailers” prior to 2022. NAICS 453998 contains a wide

variety of stores specializing in the sale of all sorts of products from art supplies to hot tubs to vaping products. Finally, we were not able to examine the effects of flavored tobacco restrictions on stores that sell tobacco products exclusively online as no data is publicly available for online tobacco stores.

References

Asare S, Majmundar A, Westmaas JL, et al. Association of Cigarette Sales With Comprehensive Menthol Flavor Ban in Massachusetts. JAMA Intern Med. 2022A;182(2):231–234. doi:10.1001/jamainternmed.2021.7333

Asare S, Majmundar A, Westmaas JL, Bandi P, Xue Z, Jemal A, Nargis N. Spatial Analysis of Changes in Cigarette Sales in Massachusetts and Bordering States Following the Massachusetts Menthol Flavor Ban. JAMA Netw Open. 2022B Sep 1;5(9):e2232103. doi: 10.1001/jamanetworkopen.2022.32103. PMID: 36107431; PMCID: PMC9478773.

Donovan E, Folger S, Akbar M, Schillo B. Classifying the comprehensiveness of flavoured tobacco sales restrictions: development and application of a tool to examine US state and local tobacco policies. Tob Control. Published online December 17, 2021:tobaccocontrol-2021-057042. doi:10.1136/tobaccocontrol-2021-057042

Kingsley M, McGinnes H, Song G, Doane J, Henley P. Impact of Massachusetts' Statewide Sales Restriction on Flavored and Menthol Tobacco Products on Tobacco Sales in Massachusetts and Surrounding States, June 2020. Am J Public Health. 2022 Aug;112(8):1147-1150. doi: 10.2105/AJPH.2022.306879. PMID: 35830660; PMCID: PMC9342823.

Missouri Census Data Center. Intro to Census Geography, Summary Levels, and GeoIDs. Accessed July 6, 2023.

National Cancer Institute and World Health Organization (2016). The Economics of Tobacco and Tobacco Control – NCI Tobacco Control Monograph 21. Bethesda MD and Geneva CH: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute, and World Health Organization.

Tauras, J.A. & Chaloupka, F.J. (2023). The Economic Effects of Cigarette Sales and Flavor Bans on Tobacco Retail Businesses. Tobacconomics.

Tauras et al. (2023). The Effects of Tobacco Flavor Restrictions on Tobacco Retail Businesses. Tobacconomics.

Tauras, J.A. and Chaloupka, F.J. (2024). Health Care Cost Savings Associated with the Massachusetts Flavor Ban on Cigarettes. A report to the Massachusetts Department of Public Health.

Truth Initiative (2024). Flavored Tobacco Policy Restrictions.

United States Food and Drug Administration (2020). FDA finalizes enforcement policy on unauthorized flavored cartridge-based e-cigarettes that appeal to children, including fruit and mint. Accessed September 15, 2023.

United States Census Bureau. City and Town Population Totals: 2010-2020. Accessed December 15, 2022.

Table 1. Regression Results for Number of Establishments

	(1) Convenience Store Establishments	(2) Convenience with Gasoline Store Establishments	(3) Tobacco Store Establishments
% of Population Covered by e-cigarette FTP	779.2	-296.8	-29.31
	(1.73)	(-0.77)	(-0.55)
% of Population Covered by cigarette FTP	309.5	799.3	103.4
	(0.55)	(1.56)	(1.44)
COVID Stay at Home Orders	31.44	19.71	3.501
	(0.21)	(0.24)	(0.23)
Real Per-Capita Income	0.0321*	0.00577	0.000854
	(2.03)	(0.35)	(0.35)
Mid Atlantic	1261.8***	1941.3**	293.3**
	(3.50)	(2.68)	(3.07)
Quarter 2	-10.07	2.973	2.032
	(-0.67)	(0.45)	(1.22)
Quarter 3	-3.304	6.260	4.512*
	(-0.20)	(0.63)	(2.12)
Quarter 4	-19.60	12.79	6.884*
	(-0.90)	(0.73)	(1.99)
2015	-72.39	-9.228	13.48
	(-1.65)	(-0.23)	(1.58)
2016	-113.1	17.65	30.21**
	(-1.50)	(0.33)	(2.33)
2017	-146.4	95.39	40.23*
	(-1.35)	(1.15)	(2.14)
2018	-139.6	109.3	42.51*
	(-1.02)	(1.06)	(2.16)
2019	-166.7	109.1	53.53*

	(-0.82)	(0.81)	(2.22)
2020	-461.7	99.27	56.63
	(-1.70)	(0.37)	(1.54)
2021	-556.2	93.50	58.78
	(-1.65)	(0.28)	(1.22)
2022		127.6	
		(0.48)	
2023		137.6	
		(0.50)	
Constant	-1708.3	164.7	-28.46
	(-1.83)	(0.16)	(-0.18)

t statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

Table 2. Regression Results for Number of Employees

	(1) Convenience Store Establishments	(2) Convenience with Gasoline Store Establishments	(3) Tobacco Store Establishments
% of Population Covered by e-cigarette FTP	2481.5	-4805.2	-289.3
	(1.55)	(-1.28)	(-1.19)
% of Population Covered by cigarette FTP	1197.9	9855.7*	541.6
	(0.59)	(2.04)	(1.51)
COVID Stay at Home Orders	-796.8	-720.1	-187.8
	(-1.38)	(-1.08)	(-1.63)
Real Per-Capita Income	0.113	-0.126	-0.00988
	(1.50)	(-0.80)	(-0.73)
Mid Atlantic	8727.9***	20867.1***	1229.9**
	(7.71)	(3.70)	(2.64)
Quarter 2	77.81	154.5	12.04

	(1.09)	(1.56)	(1.57)
Quarter 3	145.8	289.5	26.33**
	(1.66)	(1.57)	(3.02)
Quarter 4	4.644	312.2	49.11**
	(0.04)	(1.33)	(2.89)
2015	-66.01	620.8	86.41*
	(-0.28)	(1.40)	(1.93)
2016	-76.21	1127.8	136.1*
	(-0.21)	(1.68)	(2.25)
2017	-196.1	1648.8	210.6**
	(-0.39)	(1.81)	(2.71)
2018	-527.6	1875.0	208.7*
	(-0.83)	(1.67)	(2.24)
2019	-847.8	2417.9	314.5**
	(-0.99)	(1.58)	(2.60)
2020	-2019.3	3072.8	276.2
	(-1.67)	(1.05)	(1.49)
2021	-2459.7	3410.0	323.2
	(-1.67)	(0.92)	(1.35)
2022		2867.1	
		(0.91)	
2023		3146.0	
		(0.96)	
Constant	-5726.6	12056.4	795.4
	(-1.28)	(1.26)	(0.88)

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Regression Results for Inflation Adjusted Wages

	(1) Convenience Store Establishments	(2) Convenience with Gasoline Store Establishments	(3) Tobacco Store Establishments
% of Population Covered by e-cigarette FTP	604.2**	-62.68	-94.77
	(3.21)	(-0.40)	(-1.44)
% of Population Covered by cigarette FTP	36.21	-244.4	35.14
	(0.15)	(-1.52)	(0.71)
COVID Stay at Home Orders	20.35	-167.5**	36.76
	(0.37)	(-2.61)	(1.09)
Real Per-Capita Income	0.00352	0.0181**	-0.000424
	(0.44)	(2.99)	(-0.19)
Mid Atlantic	-172.4	-5.064	8.167
	(-1.69)	(-0.03)	(0.19)
Quarter 2	-7.464	40.75**	11.65*
	(-0.86)	(2.58)	(2.15)
Quarter 3	3.233	26.79**	24.88**
	(0.21)	(2.50)	(3.21)
Quarter 4	6.169	58.36***	118.0*
	(0.36)	(5.28)	(2.29)
2015	-0.966	-31.12	14.69
	(-0.03)	(-1.64)	(1.59)
2016	12.46	-12.29	29.57**
	(0.24)	(-0.86)	(2.70)
2017	-15.14	-24.12	44.78*
	(-0.23)	(-1.21)	(2.17)
2018	-34.56	-34.09	33.99**
	(-0.39)	(-1.15)	(2.57)
2019	-44.92	-99.62	54.58**

	(-0.40)	(-1.31)	(2.99)
2020	-154.9	-43.23	113.2***
	(-0.99)	(-0.50)	(4.47)
2021	-230.4	-110.6	151.1***
	(-1.20)	(-1.05)	(4.93)
2022		-4.931	
		(-0.05)	
2023		4.768	
		(0.04)	
Constant	377.1	-606.4	545.8***
	(0.81)	(-1.69)	(3.73)

t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4. Regression Results for Number of Establishments

	(1) Convenience Store Establishments	(2) Convenience with Gasoline Store Establishments	(3) Tobacco Store Establishments
	(1.45)	(-0.98)	(-0.94)
Index Flavor Restriction Cigarettes	-122.6	292.5	38.56
	(-0.52)	(1.31)	(1.29)
COVID Stay at Home Orders	23.03	11.28	2.112
	(0.15)	(0.14)	(0.14)
Real Per-Capita Income	0.0340*	0.00558	0.000848
	(1.91)	(0.34)	(0.35)
Mid Atlantic	1243.5***	1958.1**	294.6**
	(3.37)	(2.75)	(3.11)
Quarter 2	-7.075	5.074	2.554

	(-0.46)	(0.94)	(1.69)
Quarter 3	-0.466	8.893	5.188**
	(-0.03)	(0.97)	(2.46)
Quarter 4	-16.22	17.45	7.955*
	(-0.73)	(0.98)	(2.16)
2015	-73.25	-9.494	13.47
	(-1.59)	(-0.24)	(1.60)
2016	-104.7	15.41	30.15**
	(-1.55)	(0.30)	(2.36)
2017	-131.9	91.65	40.12*
	(-1.39)	(1.13)	(2.15)
2018	-122.3	104.8	42.37*
	(-1.02)	(1.05)	(2.17)
2019	-147.1	108.7	54.21*
	(-0.80)	(0.84)	(2.26)
2020	-430.4	128.1	62.75
	(-1.67)	(0.48)	(1.64)
2021	-530.6	131.8	66.57
	(-1.58)	(0.38)	(1.32)
2022		164.8	
		(0.61)	
2023		175.3	
		(0.63)	
Constant	-1829.2	171.2	-28.66
	(-1.77)	(0.16)	(-0.18)

t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Regression Results for Number of Employees

	(1) Convenience Store Establishments	(2) Convenience with Gasoline Store Establishments	(3) Tobacco Store Establishments
Index Flavor Restriction E-cigarettes	948.9	-3079.7	-205.0
	(1.36)	(-1.68)	(-1.65)
Index Flavor Restriction Cigarettes	-279.9	4000.5*	246.9
	(-0.39)	(2.00)	(1.72)
COVID Stay at Home Orders	-834.7	-852.2	-199.2
	(-1.35)	(-1.21)	(-1.70)
Real Per-Capita Income	0.120	-0.130	-0.0100
	(1.47)	(-0.83)	(-0.74)
Mid Atlantic	8674.3***	21119.0***	1243.7**
	(7.20)	(3.81)	(2.69)
Quarter 2	91.20	183.5	15.55**
	(1.22)	(1.85)	(2.37)
Quarter 3	159.7	314.8	30.14***
	(1.78)	(1.60)	(3.48)
Quarter 4	22.77	365.5	53.57**
	(0.20)	(1.55)	(3.13)
2015	-68.91	616.3	87.56*
	(-0.29)	(1.42)	(1.97)
2016	-47.65	1088.0	136.4*
	(-0.14)	(1.69)	(2.30)
2017	-147.3	1582.5	207.3**
	(-0.32)	(1.82)	(2.71)
2018	-469.5	1794.9	206.4*
	(-0.82)	(1.67)	(2.25)
2019	-776.6	2393.5	312.8**
	(-0.99)	(1.63)	(2.62)
2020	-1875.5	3455.1	313.1

	(-1.62)	(1.19)	(1.63)
2021	-2324.4	3876.5	370.7
	(-1.60)	(1.05)	(1.48)
2022		3366.2	
		(1.08)	
2023		3652.9	
		(1.13)	
Constant	-6138.7	12209.0	795.6
	(-1.29)	(1.29)	(0.89)

t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6. Regression Results for Inflation Adjusted Wages

	(1) Convenience Store Establishments	(2) Convenience with Gasoline Store Establishments	(3) Tobacco Store Establishments
Index Flavor Restriction E-cigarettes	273.7**	-15.18	-49.98
	(2.83)	(-0.20)	(-1.60)
Index Flavor Restriction Cigarettes	-154.9	-42.83	38.24*
	(-1.54)	(-0.64)	(2.05)
COVID Stay at Home Orders	16.61	-164.7**	36.11
	(0.27)	(-2.50)	(1.09)
Real Per-Capita Income	0.00491	0.0179**	-0.000595
	(0.52)	(2.93)	(-0.29)
Mid Atlantic	-187.8	-6.917	11.12
	(-1.55)	(-0.05)	(0.27)
Quarter 2	-6.220	40.05**	11.85*
	(-0.70)	(2.52)	(2.23)

Quarter 3	4.107	26.37**	25.15**
	(0.28)	(2.41)	(3.29)
Quarter 4	6.745	57.63***	118.4*
	(0.39)	(5.27)	(2.30)
2015	-1.589	-30.95	14.75
	(-0.05)	(-1.62)	(1.62)
2016	18.53	-13.08	28.71**
	(0.40)	(-0.91)	(2.66)
2017	-4.684	-25.51	43.04*
	(-0.08)	(-1.30)	(2.12)
2018	-22.11	-35.72	32.25**
	(-0.28)	(-1.18)	(2.51)
2019	-32.17	-102.2	52.82**
	(-0.31)	(-1.35)	(3.08)
2020	-143.2	-51.67	115.2***
	(-0.93)	(-0.62)	(4.60)
2021	-225.5	-118.0	154.9***
	(-1.14)	(-1.14)	(5.15)
2022		-14.69	
		(-0.16)	
2023		-4.769	
		(-0.04)	
Constant	291.2	-590.0	555.9***
	(0.53)	(-1.64)	(4.11)

t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$