

Supplementary Online Content

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eAppendix 1. Methods and Statistical Analyses

eAppendix 2. Sensitivity Analyses and Additional Results

This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix 1. Methods and Statistical Analyses

A.1. Store classification and exclusions.

The initial IRI sample included 369 stores. 291 continuously open stores were analyzed to achieve a longitudinal study design and use stores that were stable over time; stores that were not continuously open either opened after 2014, closed before the end of 2017, or closed at some point and then re-opened (e.g., closed for renovation). The combined sales data included beverage, food, and household product items for the same stores analyzed for beverage changes. When a pharmacy was located within a store, it was considered a separate pharmacy location and had its own combined sales. 51 stores were analyzed in the zip codes that border Philadelphia in neighboring counties (15 chain supermarkets, 4 mass merchandisers, and 32 pharmacies). This represented 16% of available stores in the counties. There were no convenience store chains in Philadelphia in the IRI dataset.

A.2. Beverage classification procedure.

The IRI data had 24,004 unique beverages. Forty-seven percent of those beverages (n=11,416) were classified based on their IRI-assigned category (e.g., we assumed beverages in the “soda” and “diet soda” categories were subject to the tax because the tax applies to both sugar- and artificially-sweetened drinks). There were, however, 12,588 unique beverages we could not classify based on category alone (e.g., some beverages in the juice category contained added sugar, while others did not). For these beverages, two research assistants independently looked up the ingredient list to make a determination. If research assistants could not find the ingredient list, they coded the beverage based on similar products (i.e., same manufacturer and brand, but different flavor). Coding discrepancies were reconciled through discussion. Beverages in the dataset included all non-refrigerated beverages such as sodas, juices, teas, fruit drinks, waters, and sports drinks as well as all aisle-refrigerated and beverage-case beverages including milks, refrigerated juices, and chilled beverages at checkout among others.

Energy drinks were excluded from our main analyses because of their much higher mean price-per-ounce and low volume sales. There were 821 energy drinks, which represented 3.4% of total unique beverages and 2.4% of total volume sales in Philadelphia and Baltimore in 2016. Energy drinks in Philadelphia in 2016 had a mean price-per-ounce of 37.6 ¢/oz while all other taxed beverages had a mean price per ounce of 6.2 ¢/oz. Regression analyses for energy drinks are presented in **Appendix B.8**.

A.3. Philadelphia beverage tax criteria.

Beverages subject to Philadelphia’s excise tax include soda, fruit drinks (not including 100% juice), sports drinks, flavored waters, energy drinks, pre-sweetened coffee or tea, and non-alcoholic beverages intended to be mixed into an alcoholic drink. Beverages that are not subject to Philadelphia’s excise tax include baby formulas, beverages that meet the definition of medical food, and any product for which more than 50% of its volume is milk or fresh fruit, vegetable, or a combination. The tax is also not applied to unsweetened drinks to which a purchaser can add sugar or request the addition of sugar or to any syrup or other concentrate that a customer combines with other ingredients to create a beverage (i.e. black coffee purchased at a coffee shop). No retailers are exempt.

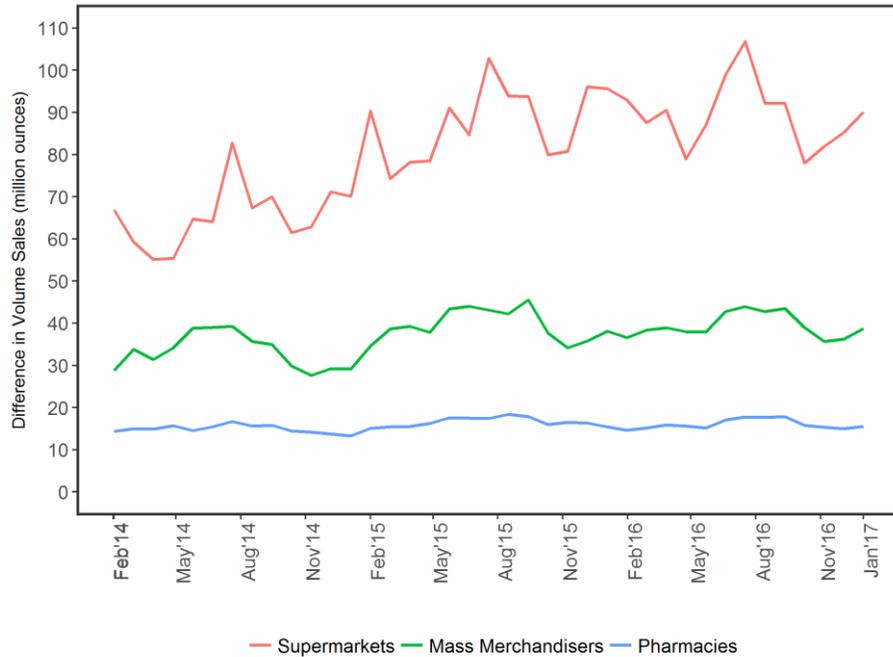
A.4. Statistical analyses.

A.4.a Test of parallel trends assumption.

The difference-in-differences approach relies on a “parallel trends” assumption, which stipulates that the pre-intervention trends in the outcome of interest are comparable for the treatment and control locations. Because volume sales were generally increasing in Baltimore in the three years prior to Philadelphia implementing its tax and volume sales were relatively flat in Philadelphia over the same time period, there was the potential for us to overestimate the tax’s influence on observed sales (**Figure A.4.a.1**). To formally test whether this parallel trends assumption holds, generalized estimating equations were used to examine volume sales during the pre-period using a continuous time variable, the location, and the interaction between the two. Separate models were run for supermarkets, mass merchandisers, and pharmacies. There were statistically significant differences in the linear increases in volume sales between Philadelphia and Baltimore for supermarkets and pharmacies when we included all pre-tax time points for which we have data (2014-2016). This indicates that including all of the available data violates the parallel trends assumption. This assumption was re-tested after restricting our pre-period sample to 2016; the monthly trends during

this one year appear flat (**Figure A.4.a.2**). The regression models examining differences in linear trends between Philadelphia and Baltimore for 2016 alone generate non-significant differences for each of the three store types, suggesting that the parallel trends assumption holds when using 2016 alone as the pre-period. This was further explored using the natural log of volume sales with similar results. We therefore restricted our dataset to 2016 and 2017 for all regression analyses, although we conduct sensitivity analyses using 2014 – 2017 data (see **appendix B.4**).

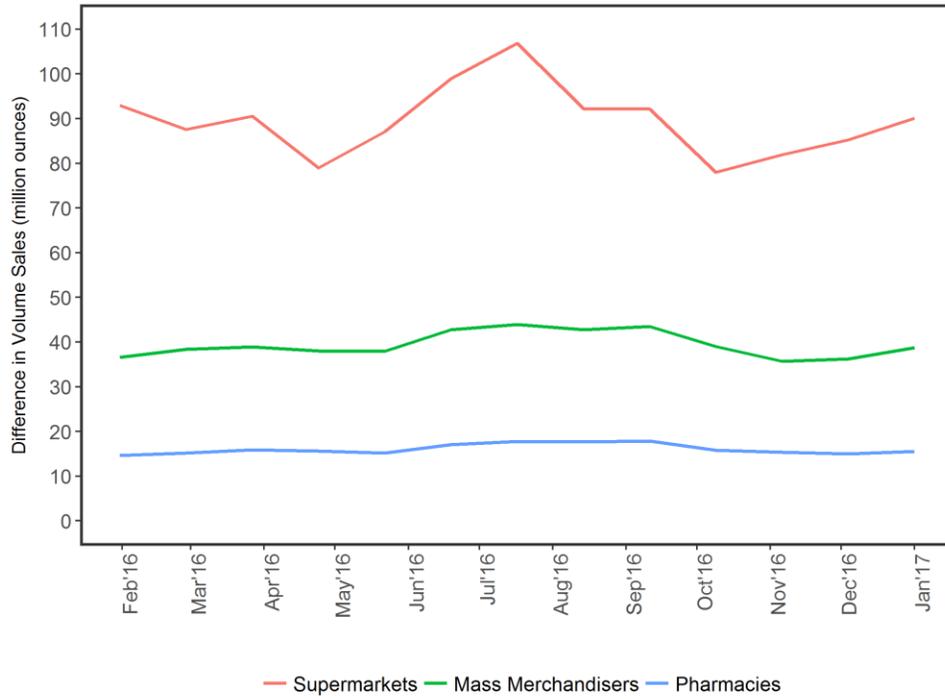
Figure A.4.a.1 Test for parallel trends: Graph of the difference in volume sales between Philadelphia and Baltimore from 2014-2016.¹



p-value for trend in Supermarkets<0.001, Mass Merchandisers=0.069, Pharmacies<0.001

¹All estimates and analyses in this paper are by the authors and not by Information Resources, Inc

Figure A.4.a.2 Test for parallel trends: Graph of the difference in volume sales between Philadelphia and Baltimore from 2016.¹



p-value for trend in Supermarkets=0.073, Mass Merchandisers=0.313, Pharmacies=0.742

¹All estimates and analyses in this paper are by the authors and not by Information Resources, Inc

A.4.b. SAS code for pass-through analyses.

Our basic model and SAS code appear below:

Model:

$$\text{Price-per-ounce} = \alpha + \beta_1 \text{ Location} + \beta_2 \text{ Tax Implementation} + \beta_3 (\text{Location} * \text{Tax Implementation}) + \varepsilon$$

SAS Code:

```
proc hpmixed data=analyze.salesdataPPU2 order=formatted;
class id;
where city in (1/*PHILADELPHIA*/ 2/*BALTIMORE*/) tax="Taxed"
classification="Supermarket/Grocery Store";
model WtPPUperOz=cityref/*0=BALTIMORE 1=PHILADELPHIA*/ yearref/*0=2016 1=2017*/
cityref*yearref/*TREATMENT EFFECT*/solution s cl;
random intercept / type=UN subject=id solution;
run;
```

A.4.c. SAS code for volume sales, unit sales, and combined sales analyses.

Our basic model and SAS code appear below:

Model:

$$\text{Volume sales} = \alpha + \beta_1 \text{ Location} + \beta_2 \text{ Tax Implementation} + \beta_3 (\text{Location} * \text{Tax Implementation}) + \varepsilon$$

SAS Code:

```
proc genmod data=analyze.taxanalytic;
class id city (ref="Baltimore") taxtime (ref=first)/param=ref;
where city in (1/*PHILADELPHIA*/ 2/*BALTIMORE*/) tax="Taxed" classification
="Supermarket/Grocery Store";
model &outcome=city/*1=PHILADELPHIA 2=BALTIMORE */ taxtime/*1=2016 2=2017*/
city*taxtime/*TREATMENT EFFECT*/ dist=normal link=id type3 wald;
repeated subject=id/ type=IND;
run;
```

Percent changes for both sets of analyses were derived using the β_3 estimate as the numerator and the sum of the intercept plus the β_1 estimate for the city of Philadelphia as the denominator. This represents the difference in Philadelphia between 2017 and 2016 divided by the value for 2016, controlling for trends in Baltimore.

A.4.d. Price elasticity calculation.

To determine the overall price elasticity for beverage sales, the percent changes in the price of taxed beverages in Philadelphia compared to Baltimore by beverage size (individual or family) and store type (supermarket, mass merchandiser, or pharmacy) was calculated. These estimates for the percent change in price were derived from the pass-through regression analyses presented in **Table 2**. The analogous percent changes in the total volume of beverages in Philadelphia compared to Baltimore by beverage size and store type using the regression analyses presented in **Table 4** were then calculated. The total decreases in volume sales (by beverage size and store type) incorporated the partially-offsetting increase in volume at the border stores by summing the change in volume sales within Philadelphia and the change in volume sales at the border stores (i.e., subtracting the increase in sales from the border stores from the decrease in sales from the Philadelphia stores). The percent change in total volume was then calculated by dividing that amount by the pre-tax estimate of volume within Philadelphia. Elasticities were calculated (for each combination of beverage size and store type) by dividing the percent change in volume sales by the percent change in price. Finally, an average elasticity (across both beverage size and store type) that was weighted by the total baseline store volume of taxed beverages for each beverage size and store type was calculated.

A.5.

Philadelphia food retailer data used to estimate IRI chain retail store coverage.

Percent estimates of IRI store coverage for supermarkets, mass merchandisers, and pharmacies in Philadelphia was based on a list compiled using the following data sources: 1) city administrative data on food licenses and tobacco permits (due to food typically being sold at establishments that sell tobacco), 2) commercially available data from Nielsen TD Linx including all off-premise retailers, 3) publicly available data on SNAP and WIC retailers, and 4) the city's internally maintained lists of small local retailers such as farmer's markets and crop shares. Data sources used for compilation of the list included time periods ranging from January 2017 to December 2018. All sources were merged and duplicates based on names and addresses were removed. This provided a final list of available food retailers in the city of Philadelphia, which was then matched to the list of retailers included in the IRI dataset to obtain an estimate of total percentage of Philadelphia stores covered in IRI data. This approach maximized accuracy compared to commercially available sources, which are known to have reliability and validity problems.¹

Reference:

¹Colabianchi N, Lamichhane AP, Barnes TL, Hibbert JD, Porter DE et al. Validation of 3 food outlet databases: Completeness and geospatial accuracy in rural and urban food environments. *American Journal of Epidemiology*, 2010; 172: 1324–1333.

A.6. Philadelphia revenue data.

Philadelphia Department of Revenue data was used to approximate the proportion of total ounces of taxed beverage sales in Philadelphia covered by the IRI data. Publicly posted revenue collections data from the Philadelphia Department of Revenue available for January to June 2017 (\$32,549,120) (<https://beta.phila.gov/media/20180212155650/General-Comparative-Stmts-201712.pdf>) and for July to December 2017 (\$39,765,552) (<https://beta.phila.gov/media/20180301161805/General-Comparative-Stmts-201801.pdf>) totaled \$72,314,672. Volume sales of taxed beverages in Philadelphia totaled 1,212,697,532 ounces January to December 2017. Applying the tax rate of \$0.015 per ounce, this translates to taxed beverage sales totaling \$18,190,462.97. Therefore, the IRI data used in this study represent 25% (excluding non-compliant beverage sales) of ounces of taxed beverages sold in Philadelphia. The remainder of beverage sales not included in the analyses could come from a combination of small, independent stores, restaurants and bars, and large chain retailers and convenience stores that do not have agreements to share data with IRI.

eAppendix 2. Sensitivity Analyses and Additional Results

B.1. Regression results for change in beverage price-per-ounce for PA border stores compared to Baltimore stores.

**Change in Price-per-Ounce[&]
PA Border Stores vs. Baltimore Stores**

	Philadelphia		Baltimore		% Change in Price-per-oz	Difference-in-Differences Estimated Change in Price (¢/oz) [§]	95% CI	Corrected p-value*
	2016 Mean Price (¢/oz)	2017 Mean Price (¢/oz)	2016 Mean Price (¢/oz)	2017 Mean Price (¢/oz)				
<u>Taxed Beverages</u>								
Supermarkets	5.40	5.64	5.33	5.50	1.7	0.09	0.04 - 0.14	<.001
Mass Merchandisers	4.84	5.05	6.34	6.52	2.5	0.12	-0.06 - 0.30	.47
Pharmacies	6.82	7.16	6.76	6.93	2.2	0.15	0.07 - 0.22	<.001
<u>Taxed - Beverage Size^{†‡}</u>								
Individual	9.06	9.39	8.43	8.75	0.3	0.02	-0.09 - 0.13	>.99
Family	3.88	3.96	3.80	3.82	1.7	0.06	0.04 - 0.09	<.001
<u>Taxed - Sweetener Type[‡]</u>								
Sugar	5.60	5.82	5.50	5.63	2.0	0.11	0.06 - 0.16	<.001
Artificial	4.67	4.99	4.60	4.90	0.0	0.00	-0.09 - 0.09	>.99
<u>Not Taxed Beverages</u>								
Supermarkets	8.71	8.98	8.85	8.90	2.4	0.21	0.12 - 0.30	<.001
Mass Merchandisers	6.77	6.85	8.88	8.90	2.0	0.14	-0.14 - 0.41	>.99
Pharmacies	7.56	7.65	7.62	7.70	0.6	0.05	-0.08 - 0.17	>.99
<u>Not Taxed - Beverage Size^{†‡}</u>								
Individual	13.01	13.18	13.05	13.02	1.6	0.21	0.06 - 0.36	.002
Family	5.43	5.46	5.58	5.56	2.7	0.04	-0.01 - 0.09	.18

[&]Weighted price of each beverage was calculated by IRI as the mean over a 4-week period weighted by unit sales of that item at that price. These prices were divided by volume (in ounces) to determine weighted price-per-ounce.

^{*}Bonferroni corrections used six comparisons for store analyses by tax status, four for beverage size by tax status, and two for sweetener type

[†]Individual beverage size was defined as <36 ounces based on the Food and Drug Administration’s definition of a beverage serving size consumed in one sitting

[‡]Analyses of beverage size and sweetener type are for supermarkets only

[§]Difference-in-differences estimates and percent change in price-per-ounce are based on regression estimates. The percent change in price was calculated by dividing the difference-in-differences estimate by the sum of the intercept plus the estimate for PA border stores. The numerator represents the change in price in PA border stores in 2017 compared to 2016 controlling for Baltimore and the denominator represents the mean price in PA border stores in 2016. The difference-in-differences estimate is the point estimate of the interaction term and represents the change in price-per-ounce in PA border stores in 2017 compared to 2016 controlling for secular trends using Baltimore as a control.

B.2. Regression results using stores continuously open between 2016 and 2017

The main analyses excluded stores which were only partially open during the 2014-2017 period. To examine whether this exclusion criteria biased the results, an analysis with all stores that were continuously open from 2016 through 2017 (rather than all stores that were continuously open from 2014 through 2017) was run. This yielded an additional 11 stores in the sample (Philadelphia: 1 mass merchandiser, 3 pharmacies; Baltimore: 3 supermarkets, 2 pharmacies; Border zip codes: 2 pharmacies). The results do not meaningfully change. For example, the main volume sales analysis shows a 2.85 million ounce reduction in volume sales in Philadelphia supermarkets compared to a 2.88 million ounce reduction using the stores continuously open from 2016-2017. See **Table B.1.a** below.

Table B.2.a Change in beverage prices: Regression results using stores continuously open between 2016-2017

	Difference-in-differences estimated change in price (¢/oz)	% Pass- Through	95% CI	Corrected p-value*
<u>Taxed</u>				
Supermarkets	0.65	43.5	0.61 – 0.69	<.001
Mass Merch.	0.90	59.7	0.75 – 1.04	<.001
Pharmacies	1.55	103.3	1.49 – 1.61	<.001
<u>Not Taxed</u>				
Supermarkets	0.09	6.2	0.01 – 0.17	.014
Mass Merch.	0.10	6.8	-0.13 – 0.33	>.99
Pharmacies	0.15	10.1	0.06 – 0.25	<.001

Table B.1.b Change in volume sales (million oz) regression results using stores continuously open between 2016-2017

	Difference-in-differences estimate	% Change	95% CI	Corrected p-value
Volume Sales (million oz)				
<u>Taxed</u>				
Supermarkets	-2.88	-59.3	-4.13 – -1.63	<.001
Mass Merch.	-1.36	-42.3	-2.25 – -0.48	<.001
Pharmacies	-0.02	-13.6	-0.04 – -0.01	<.001
<u>Not Taxed</u>				
Supermarkets	0.19	3.1	-0.18 – 0.57	>.99
Mass Merch.	-0.38	-6.8	-0.92 – 0.16	.37
Pharmacies	0.00	-1.0	-0.01 – 0.01	>.99

*Bonferroni corrections used six comparisons for store analyses by tax status

B.3. Regression results using all stores regardless of whether they opened or closed in 2016 or 2017

The main analyses excluded stores which were only partially open during the 2014-2017 period. To examine whether only using stores that were continuously open biased the results, additional sensitivity analyses including all stores in the sample that had any data in 2016 or 2017 were conducted. This added 22 stores to our sample size, as well as the 11 stores from the analysis presented in **Table B.2.a** (Philadelphia: 4 supermarkets, 3 mass merchandisers, 4 pharmacies; Baltimore: 1 supermarket, 5 pharmacies; PA border zip codes: 2 supermarkets, 2 mass merchandisers, 1 pharmacy). The results do not meaningfully change. The main volume analysis shows a 2.85 million ounce reduction in volume sales in Philadelphia supermarkets compared to a 2.95 million ounce reduction using all stores.

Table B.3.a Change in beverage prices: Regression results using all stores regardless of whether they opened or closed

	Difference-in-differences estimated change in price (¢/oz)	% Pass-Through	95% CI	Corrected p-value
<u>Taxed</u>				
Supermarkets	0.65	43.0	0.60 – 0.69	<.001
Mass Merch.	0.90	59.7	0.75 – 1.04	<.001
Pharmacies	1.54	102.5	1.48 – 1.59	<.001
<u>Not Taxed</u>				
Supermarkets	0.09	6.3	0.02 – 0.17	.010
Mass Merch.	0.10	6.6	-0.13 – 0.33	>.99
Pharmacies	0.15	9.9	0.06 – 0.24	<.001

Table B.2.b Change in volume sales (million oz.): Regression results using all stores regardless of whether they opened or closed

	Difference-in-differences estimate	% Change	95% CI	Corrected p-value
<u>Taxed</u>				
Supermarkets	-2.95	-60.5	-4.15 – -1.75	<.001
Mass Merch.	-1.31	-43.7	-2.22 – -0.39	.001
Pharmacies	-0.02	-13.8	-0.04 – -0.01	<.001
<u>Not Taxed</u>				
Supermarkets	0.12	1.9	-0.42 – 0.66	>.99
Mass Merch.	-0.51	-9.8	-1.53 – 0.51	>.99
Pharmacies	0.00	-0.8	-0.01 – 0.01	>.99

*Bonferroni corrections used six comparisons for store analyses by tax status

B.4. Regression results using 2014 – 2017 data.

Tables B.4.a and B.4.b below show regression results for pass-through and volume sales when all years of data (2014-2017) are included, even though the parallel trends assumption does not hold for 2014-2016. Although there are some minor differences, the results and conclusions generally hold. In this sensitivity analysis, the formerly-significant 12.6% decline in volume of taxed beverages at pharmacies in Philadelphia becomes a non-significant 5.5% decline and the formerly-significant 8% decline in combined sales at supermarkets becomes a non-significant 3.9% decline. The formerly-non-significant change in non-taxed beverage volume sales at supermarkets in Philadelphia becomes a significant 16.6% increase.

Table B.4.a. Regression results for beverage tax pass-through for Philadelphia compared to Baltimore stores and stores in PA zip codes bordering Philadelphia compared to Baltimore, 2014 - 2017

Philadelphia Stores vs. Baltimore Stores				
	Difference-in-differences estimated change in price (¢/oz)	% Pass- Through	95% CI	Corrected p-value
<u>Taxed</u>				
Supermarkets	0.69	46.0	0.66 – 0.73	<.001
Mass Merch.	0.71	47.6	0.60 – 0.83	<.001
Pharmacies	1.55	103.4	1.51 – 1.60	<.001
<u>Not Taxed</u>				
Supermarkets	-0.05	-3.5	-0.12 – 0.02	.27
Mass Merch.	0.20	13.0	0.01 – 0.38	.03
Pharmacies	0.13	8.8	0.05 – 0.21	<.001
PA Border Zip Code Stores vs. Baltimore Stores				
<u>Taxed</u>				
Supermarkets	0.12	8.2	0.08 – 0.16	<.001
Mass Merch.	-0.09	-6.0	-0.23 – 0.05	.50
Pharmacies	0.22	14.4	0.16 – 0.28	<.001
<u>Not Taxed</u>				
Supermarkets	0.15	9.9	0.07 – 0.23	<.001
Mass Merch.	0.09	6.0	-0.13 – 0.31	>.99
Pharmacies	0.23	15.4	0.13 – 0.33	<.001

*Bonferroni corrections used six comparisons for store analyses by tax status

Table B.4.b. Regression results for beverage volume sales comparing Philadelphia to Baltimore stores and stores in PA border zip codes to Baltimore stores, 2014 – 2017

Philadelphia Stores vs. Baltimore Stores				
	Difference-in-differences estimate	% Change	Lower 95% CI	Corrected p-value
<u>Volume Sales (million oz)</u>				
<u>Taxed</u>				
Supermarkets	-2.48	-54.3	-3.67 – -1.29	<.001
Mass Merch.	-1.06	-37.2	-1.89 – -0.22	.005
Pharmacies	-0.01	-5.5	-0.03 – 0.01	.94
<u>Not Taxed</u>				
Supermarkets	0.91	16.6	0.41 – 1.41	<.001
Mass Merch.	-0.15	-2.9	-0.83 – -0.53	>.99
Pharmacies	0.00	2.3	-0.01 – 0.02	>.99
<u>Combined Sales (thousand \$)[§]</u>				
Supermarkets	-77.27	-3.9	-163.47 – 8.94	.10
Mass Merch.	-41.81	-1.8	-163.46 – 79.83	>.99
Pharmacies	1.53	0.8	-3.48 – 6.53	>.99
<u>PA Border Zip Code Stores vs. Baltimore Stores</u>				
	Difference-in-differences estimate	% Change	95% CI	Corrected p-value
<u>Volume Sales (million oz)</u>				
<u>Taxed</u>				
Supermarkets	1.39	53.2	0.55 – 2.23	<.001
Mass Merch.	1.59	67.2	0.51 – 2.67	.001
Pharmacies	0.05	44.4	0.03 – 0.08	<.001
<u>Not Taxed</u>				
Supermarkets	0.58	18.6	0.33 – 0.84	<.001
Mass Merch.	0.17	3.8	-0.08 – 0.41	.43
Pharmacies	0.00	1.2	-0.01 – 0.01	>.99
<u>Combined Sales (thousand \$)[§]</u>				
Supermarkets	151.53	9.5	63.41 – 239.65	<.001
Mass Merch.	159.02	7.6	23.22 – 294.83	.02
Pharmacies	8.10	4.4	0.88 – 15.32	.02

§Combined sales include food, beverages, and some household products (e.g., paper towels). Many product categories (e.g., electronics, clothing, jewelry, prescription drugs, etc.) are not available, so although these data are all the sales available from IRI, this outcome does not represent total store sales or total store revenue.

*Bonferroni corrections used six comparisons for store analyses by tax status

B.5. Regression results with additional covariates controlling for seasonality

Multiple approaches to the models were considered for volume sales. In sensitivity analyses, an indicator was added for fiscal quarter to control for seasonal effects. When this indicator was included, the treatment effect parameter was unchanged, but the intercept is attenuated slightly, resulting in very small differences in the estimate of the percent change attributable to the tax (**Table B.4.a**). Because models that are more parsimonious typically represent the data better, fiscal quarter was excluded as a covariate in the main analyses.

Table B.5.a. Regression results for beverage volume sales in 2016 and 2017 comparing Philadelphia to Baltimore stores including an indicator for fiscal quarter

	Difference- in- differences estimate	% Change	95% CI	Corrected p-value
Volume Sales (million oz)				
<u>Taxed Beverages</u>				
Supermarkets	-2.85	-56.6	-4.10 – -1.60	<.001
Mass Merch.	-1.20	-40.7	-2.05 – -0.36	.001
Pharmacies	-0.02	-12.5	-0.03 – -0.01	<.001
<u>Not Taxed Beverages</u>				
Supermarkets	0.26	4.2	-0.08 – 0.61	.25
Mass Merch.	-0.39	-7.5	-0.97 – 0.18	.42
Pharmacies	0.00	-0.9	-0.01 – 0.01	>.99

*Bonferroni corrections used six comparisons for store analyses by tax status

B.6. Regression results for change in beverage prices and volume sales in Philadelphia alone (before and after) without a control site

Sensitivity analyses were conducted for both the change in price and volume sales in Philadelphia stores (before and after the tax) without a control. Although the increase in beverage prices is greater (from 0.65 ¢/oz. among supermarkets in our main analysis to 0.80 ¢/oz), volume sales are similar (e.g., from -2.85 million oz. among supermarkets in our main analysis to -2.87 million ounces).

Table B.6.a. Regression results for change in beverage prices in Philadelphia without a control group

	Estimated change in price (¢/oz)	% Pass- Through	95% CI	Corrected p-value
<u>Taxed</u>				
Supermarkets	0.80	53.0	0.77 – 0.82	<.001
Mass Merch.	1.05	70.0	0.99 – 1.11	<.001
Pharmacies	1.76	117.2	1.73 – 1.79	<.001
<u>Not Taxed</u>				
Supermarkets	0.19	12.5	0.14 – 0.23	<.001
Mass Merch.	0.13	8.6	0.04 – 0.22	.001
Pharmacies	0.18	12.3	0.14 – 0.23	<.001

Table B.6.b. Regression results for change in volume sales in Philadelphia without a control group

	Estimated change in volume sales	% Change	95% CI	Corrected p-value*
Volume Sales (million oz)				
<u>Taxed</u>				
Supermarkets	-2.87	-59.1	-4.12 – -1.62	<.001
Mass Merch.	-1.26	-42.3	-2.11 – -0.41	.001
Pharmacies	-0.03	-21.6	-0.05 – -0.02	<.001
<u>Not Taxed</u>				
Supermarkets	0.23	3.7	-0.11 – 0.57	.45
Mass Merch.	-0.34	-6.2	-0.91 – 0.22	0.663
Pharmacies	-0.01	-3.2	-0.01 – 0.00	.006

*Bonferroni corrections used six comparisons for store analyses by tax status

B.7. Regression results using non-border county stores as a control

As an additional sensitivity analysis, county stores that did not border Philadelphia were used as a secondary control. The general pattern of changes in price hold, although the pass-through for supermarkets is lower. This lower price change using non-border county stores as controls is due to higher prices in non-border county stores compared to Baltimore (the original control). Results for the change in volume sales are similar.

Table B.7.a Regression results for change in beverage prices using non-border county stores as a control

	Difference-in-differences estimated change in price (¢/oz)	% Pass- Through	95% CI	Corrected p-value
<u>Taxed</u>				
Supermarkets	0.54	35.6	0.50 – 0.57	<.001
Mass Merch.	0.70	46.4	0.62 – 0.77	<.001
Pharmacies	1.31	87.3	1.26 – 1.36	<.001
<u>Not Taxed</u>				
Supermarkets	-0.21	-13.8	-0.27 – -0.14	<.001
Mass Merch.	0.17	11.0	0.04 – 0.29	.002
Pharmacies	0.09	6.1	0.03 – 0.16	.002

Table B.7.b Regression results for change in beverage volume sales using non-border county stores as a control

	Difference-in-differences estimated change in volume	% Change	95% CI	Corrected p-value
Volume Sales (million oz)				
<u>Taxed</u>				
Supermarkets	-2.80	-57.8	-4.05 – -1.56	<.001
Mass Merch.	-1.55	-52.2	-2.43 – -0.68	<.001
Pharmacies	-0.03	-16.5	-0.04 – -0.01	<.001
<u>Not Taxed</u>				
Supermarkets	0.23	3.7	-0.12 – 0.57	.49
Mass Merch.	-0.49	-8.9	-1.07 – 0.09	.15
Pharmacies	0.00	-1.2	-0.01 – 0.00	>.99

*Bonferroni corrections used six comparisons for store analyses by tax status

B.8. Regression results for changes in the price-per-ounce and volume sales of energy drinks

Energy drinks were excluded from our primary analyses because of their very high price-per-ounce and relatively low volume in baseline sales. Below are the results for the change in price-per-ounce (**Table B.7.a**) and the change in volume sales (**Table B.7.b**) of sugar- or artificially-sweetened energy drinks. Overall, the price-per-ounce of these beverages significantly decreased by 4.18 ¢/oz in Philadelphia supermarkets (and by 3.87 ¢/oz in PA border zip code supermarkets) (**Table B.7.a**). This reflects what appears to be a shift in the market of these beverages towards larger sizes. We see a statistically significant effect in volume sales among Philadelphia supermarkets (-862.73 oz, -15.9%, $p=.001$) and there was an increase in the sale of these beverages among supermarkets (1,110.77 oz, 21.4%, $p=.006$) and pharmacies (224.91 oz, 12.2%, $p=.003$) in the PA border zip codes (**Table B.7.b**).

Table B.8.a Regression results for change in price for energy drinks, 2016-2017

	Difference-in-differences estimated change in price (¢/oz)	% Change	95% CI	Corrected p-value
Philadelphia Stores vs. Baltimore Stores				
Supermarkets	-4.18	-278.7	-5.86 – -2.50	<.001
Mass Merch.	2.39	159.4	-0.87 – 5.65	.24
Pharmacies	1.45	96.7	0.20 – 2.71	.02
PA Border Zip Code Stores vs. Baltimore Stores				
Supermarkets	-3.87	-257.8	-5.86 – -1.88	<.001
Mass Merch.	1.68	112.1	-2.69 – 6.05	>.99
Pharmacies	-1.80	-120.1	-3.42 – -0.19	.02

*Bonferroni corrections used three comparisons for store analyses

Table B.8.b Regression results for change in volume sales of energy drinks, 2016-2017

	Difference-in- differences estimate (oz)	% Change	95% CI	Corrected p- value
Philadelphia Stores vs. Baltimore Stores				
Supermarkets	-862.73	-15.9	-1,431.49 – -293.97	.001
Mass Merch.	-3,089.68	-20.2	-7,686.38 – 1,507.01	.32
Pharmacies	22.49	0.8	-112.05 – 157.03	>.99
PA Border Zip Code Stores vs. Baltimore Stores				
Supermarkets	1,110.77	21.4	244.61 – 1,976.94	.006
Mass Merch.	3,983.04	26.2	-88.32 – 8,054.40	.06
Pharmacies	224.91	12.2	62.32 – 387.50	.003

*Bonferroni corrections used three comparisons for store analyses

B.9. Regression results for sales of liquid and powdered drink concentrates.

Table B.9.a. Shows our regression results for unit and dollar sales of liquid and powder drink concentrates for 2017 compared to 2016 in Philadelphia compared to Baltimore and the PA border zip code stores compared to Baltimore. Because liquid and powdered concentrates are not subject to the tax, they might be a likely substitute for sweetened drinks. These results indicate, however, that there were no significant changes in the sale of liquid and powder drink concentrates in Philadelphia or the PA border zip codes after the tax was implemented.

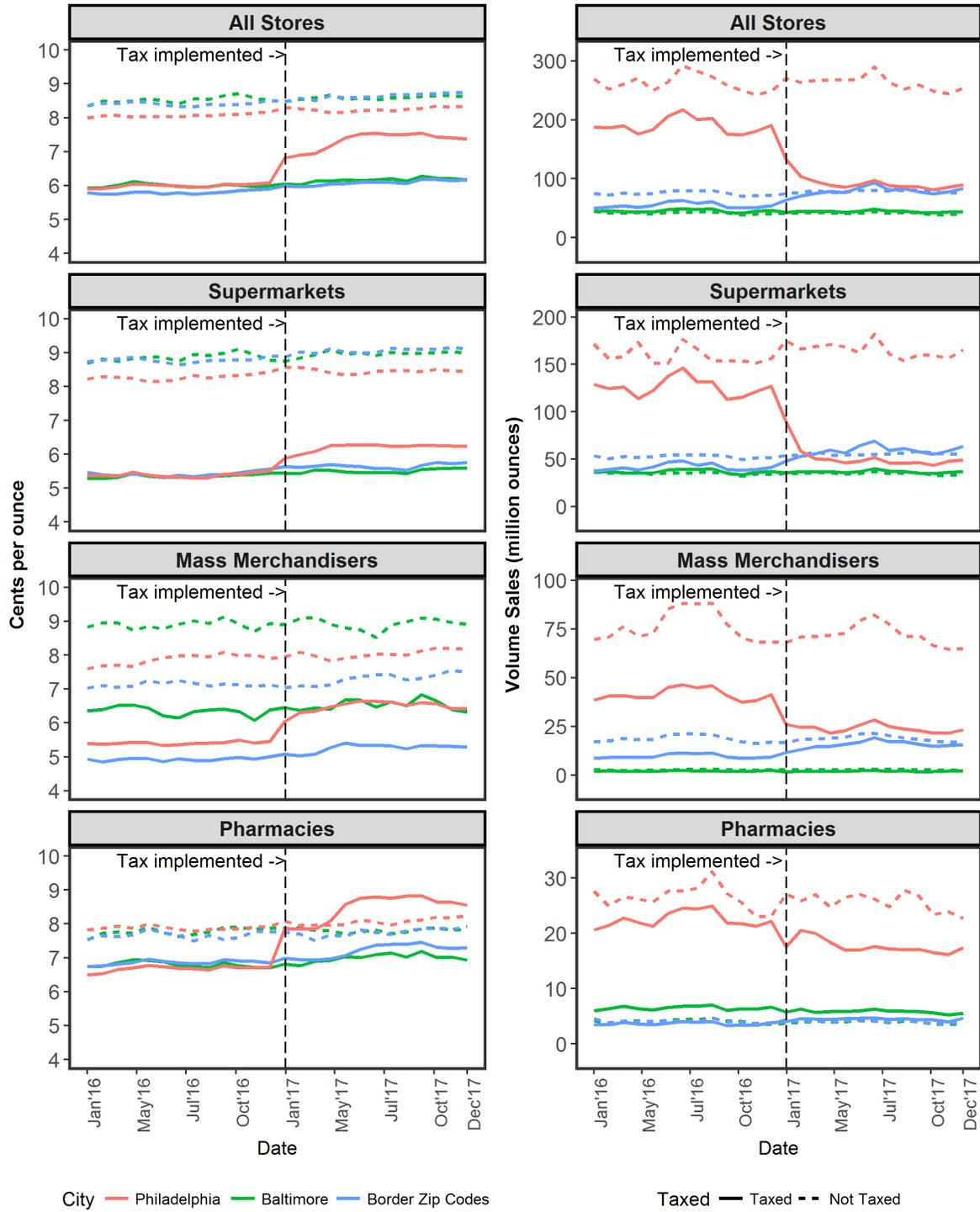
B.9.a. Regression results for sales of liquid and powdered drink concentrates.

	Difference -in- differences estimate	Percent	95% CI	Corrected p-value
Change in Unit Sales				
Philadelphia Stores vs. Baltimore Stores				
Supermarkets	-48.60	-16.7	-116.26 – 19.05	.26
Mass Merch.	4.00	2.7	-29.91 – 37.90	>.99
Pharmacies	-1.53	-11.9	-5.72 – 2.66	>.99
PA Border Zip Code Stores vs. Baltimore Stores				
Supermarkets	26.50	13.0	-31.99 – 84.99	.83
Mass Merch.	11.75	9.8	-34.42 – 57.92	>.99
Pharmacies	1.63	19.4	-2.09 – 5.35	.88
Change in Dollar Sales				
Philadelphia Stores vs. Baltimore Stores				
Supermarkets	-\$82.77	-11.6	-\$221.17 – \$55.63	.46
Mass Merch.	\$7.62	1.8	-\$63.90 – \$79.15	>.99
Pharmacies	-\$3.15	-13.2	-\$11.29 – \$5.00	>.99
PA Border Zip Code Stores vs. Baltimore Stores				
Supermarkets	\$47.29	9.2	-\$82.29 – \$176.87	>.99
Mass Merch.	\$29.64	8.5	-\$41.40 – \$100.67	.95
Pharmacies	\$2.14	14.0	-\$5.11 – \$9.38	>.99

*Bonferroni corrections used three comparisons for store analyses

B.10. Additional figure displaying results for taxed and non-taxed beverages

Figure B.10. Change in beverage prices and volume sales for taxed and non-taxed beverages sold in chain retail stores in Philadelphia, Baltimore, and PA zip codes bordering Philadelphia before and after tax implementation¹



¹All estimates and analyses in this paper are by the authors and not by Information Resources, Inc.

B.11. Changes by zip code in unadjusted total volume (millions of oz.) of beverages subject to the tax sold at large chain retailers in Baltimore City, 2016-2017

Figure 1. Zip code level changes in unadjusted total volume change of beverages in Baltimore City in large chain retailers, 2016 to 2017

