

Two Year Report: Store Audits

THE EVALUATION OF SEATTLE'S SWEETENED BEVERAGE TAX

MARCH 2023

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TAXED AND NON-TAXED BEVERAGE PRICES USING STORE AUDITS

SUMMARY

The primary objective of the store audits is to see what portion of the 1.75 cents per ounce tax on sweetened beverages levied on beverage distributors was passed through to customers (“price pass-through”) in Seattle. In this report, we examine price pass-through of the tax approximately two years after the tax was implemented. We examine average overall price pass-through as well as by store type and beverage type. Secondary objectives include assessing how the price pass-through changed over time by comparing the degree of pass-through at 6 months, 12 months, and two years post-tax. We additionally assess whether the price pass-through was different for stores near the border of Seattle and whether the tax impacted the price of non-taxed beverages.

Trained staff collected information about beverage prices in stores and restaurants in-person in Seattle and a comparison area (Federal Way, Kent, and Auburn where there was no sugary beverage tax) before the tax was implemented (baseline), six months, twelve months, and approximately two years after the tax had been in effect. At the two-year follow-up, we collected prices from a total of 21,940 beverages in 394 stores and restaurants. We included seven different types of stores or restaurants: warehouses, supermarkets and superstores, grocery stores, drug stores, small stores, quick service restaurants, coffee shops. In analyses we combine grocery and drug stores, for a total of six store type categories. We included seven categories of taxed beverages: soda, juice drinks, sports beverages, energy beverages, bottled sweetened tea, bottled sweetened coffee, and the sweetened flavor syrup added to coffee beverages in coffee shops. We included 14 categories of non-taxed beverages: diet soda, 100% juice, diet sports drinks, diet energy beverages, water, milk, sugar-free powdered beverage mix, diet or unsweetened bottled tea, diet or unsweetened bottled coffee, chocolate milk, sweetened powdered beverage mix, milk-based sugar-free and sugar-added prepared coffee beverages, sugar-free flavored syrup added to coffee beverages.

MAIN FINDINGS

Two years after the implementation of Seattle’s Sweetened Beverage Tax, we continue to observe high and consistent pass-through of the price of the tax on sugary, taxed beverages to consumers in the city of Seattle.

Overall, using a weighted average and accounting for store type distributions in Seattle, we found an average statistically significant price pass-through of 1.73 cents per ounce relative to the comparison area, or 99% of the tax, two years after tax implementation.

In analyses for specific beverage types, we found statistically significant price increases in all beverage categories, except sweetened syrup added to coffee (which has an ambiguous tax status) and bottled coffees, with pass-through percentages ranging from 42% (bottled coffee) to 91% (soda and juice drinks).

Pass-through was statistically significant for each store type in Seattle relative to the comparison area and ranged from 75% in small stores to 110% in grocery and drug stores. Average pass-through in supermarkets was 87%. We found that pass-through was lower on average among stores within one mile of the northern or southern border of Seattle (64% pass-through for all taxed beverages).

Comparing the short-term (6-month), medium-term (12-month), and long-term (two years), we saw little price change from the pass-through seen at 6-month post-tax. The higher prices among taxed beverages in Seattle appear to be sustained in the long-term.

The prices of four non-taxed beverages increased above and beyond changes seen in the comparison area--diet soda (0.39 cents), diet sports beverages (0.41 cents), powdered sugar-free drink mixes (0.07 cents), and powdered sugary drink mixes (0.18 cents) increased significantly. By store type, prices of non-taxed beverages increased among supermarkets/superstores (0.16 cents per ounce) and small stores (0.39 cents per ounce).

OBJECTIVE

The main questions answered in this report are:

1. How much of the 1.75 cents per ounce tax on sugary beverages put on distributors in Seattle was passed through to consumers via higher in-store or in-restaurant prices (“price pass-through”)?
 - a. Did the amount of tax passed through to the consumer vary by beverage type and by store/restaurant type?
 - b. How did price pass-through differ across time, from 6-months to 12-months to two years post-tax implementation?
 - c. Did the amount of tax passed through to the consumer differ for stores within Seattle but near border compared to the citywide average, as border stores are more proximal to stores outside Seattle who are not subject to the tax?
2. Did the price of non-taxed beverages change as a result of the sugary beverage tax?

RESULTS AND DISCUSSION

In this Results and Discussion section we briefly describe the methods used in this study. A detailed description of these methods is in **Appendix A**.

Stores, restaurants, and beverages included in the study sample.

Trained data collectors surveyed stores in-person in Seattle and the comparison area (Federal Way, Kent, and Auburn) to collect beverage prices at four time points: before the tax was implemented (baseline, October–November 2017), and approximately six months (May–July 2018), 12 months (October–November 2018), and two years after the tax went into effect (October–November 2019).

Of the 456 stores in our sample at baseline (pre-tax), 413 (91%) were re-surveyed during the 6-month post-tax follow up visit, 386 at 12-months post-tax (85% of stores surveyed at baseline), and 394 at two years post-tax (86% of baseline sample; **Table 1**). At two years post-tax, 42 (9%) had permanently closed or no longer met study criteria, and 20 (4%) refused to participate.

A total of 21,940 beverages in 394 stores and restaurants were surveyed for price. Prices, both discounted and non-discounted, were collected for multiple types of taxed and non-taxed beverages from different types of stores or restaurants: supermarkets/superstores, grocery stores/drug stores, small stores, quick service restaurants, coffee shops. The analyses used lowest price each beverage could be purchased for on the day the store was surveyed, converted to price per ounce to mirror the unit of the tax, with the exception of the syrups added to coffee drinks, which were of variable and often unknown sizes. For these items, the price could not be confidently converted to price per ounce and instead is price per syrup shot, which is approximately 2-3 ounces).

TABLE 1. NUMBER OF STORES SURVEYED OF EACH STORE TYPE, AT BASELINE AND TWO YEARS POST-TAX, FOR SEATTLE AND COMPARISON AREA (FEDERAL WAY, KENT, AUBURN)

RETAIL TYPE	SEATTLE			COMPARISON AREA		
	BASELINE	24-MO	RE-SURVEY RATE	BASELINE	24-MO	RE-SURVEY RATE
SUPERSTORE & SUPERMARKET	30	27	90%	22	21	95%
GROCERY & DRUG STORES	48	44	92%	27	25	93%
SMALL STORES	72	64	89%	81	64	79%
WAREHOUSES	1	1	100%	1	1	100%

QUICK-SERVICE RESTAURANT	45	40	88%	73	61	84%
COFFEE SHOPS	29	25	86%	27	21	78%
SUBTOTAL	225	201	89%	231	193	84%

Store definitions are provided in Appendix B.

Appendix C displays the beverage types and individual beverages that we examined in each beverage type category. For each beverage measured, we recorded the price and availability of multiple packaging sizes (e.g., 12oz cans, 20oz bottles, 1-liter bottles, 12 packs of 12oz cans).¹ **Table 2** displays the total number of beverages, grouped by beverage type and by store type, for which we recorded a price during the baseline and 24-month post-tax visit.

TABLE 2. TOTAL NUMBER OF BEVERAGES SURVEYED AT BOTH BASELINE AND TWO YEARS POST-TAX, GROUPED BY BEVERAGE TYPE AND STORE TYPE	
	NUMBER OF BEVERAGES INCLUDED IN ANALYSIS (N=21,940)
TAXED BEVERAGES	10,478
SODA	5,564
SPORTS BEVERAGES	1,274
ENERGY BEVERAGES	2,072
JUICE DRINKS	274
TEA, BOTTLED	796
SUGARY SYRUP ADD ON	68
COFFEE, BOTTLED	498
NON-TAXED SUGAR-FREE BEVERAGES	10,278
DIET SODA	3,728
DIET SPORTS BEVERAGES	568
DIET ENERGY BEVERAGES	1,706
100% JUICE	458
MILK	1,992
WATER	946
POWDERED SUGAR-FREE	226
TEA, BOTTLED SUGAR-FREE	476
COFFEE, SUGAR-FREE PREPARED	178
SUGAR-FREE SYRUP ADD-ON	56
NON-TAXED SUGAR-SWEETENED BEVERAGES	1,184

¹ Please contact the study team for a full copy of the two-year survey instruments.

CHOCOLATE MILK	536
POWDERED SUGAR ADDED	510
COFFEE, PREPARED (E.G., SWEETENED LATTES)	138
BEVERAGES WITHIN EACH STORE TYPE	
SUPERSTORES/SUPERMARKETS	7,180
GROCERY/DRUG STORES	5,816
SMALL STORES	7,774
WAREHOUSES	94
COFFEE SHOPS	316
QUICK SERVICE RESTAURANTS	760

QUESTION 1 RESULTS | HOW MUCH OF THE 1.75 CENTS PER OUNCE TAX ON SUGARY BEVERAGES PUT ON DISTRIBUTORS IN SEATTLE WAS PASSED THROUGH TO CONSUMERS VIA HIGHER IN-STORE OR IN-RESTAURANT PRICES (“PRICE PASS-THROUGH”)?

Our primary goal was to assess the impact of the tax on prices of beverages. To do so, we tested whether the change in prices of taxed beverages in Seattle as compared to changes in prices in the comparison area from before to after the tax was implemented. Conceptually, we used the price changes in the comparison area as an estimate of what we think would have happened to prices in Seattle had Seattle not passed a tax (i.e. changes due to market trends, inflation, seasonality). We attribute any change in price in Seattle above and beyond changes in the comparison area to the tax. Statistically speaking, we used a statistical difference-in-difference model to estimate how much the price of beverages in Seattle changed above and beyond price changes for the same beverages in the comparison area. The difference-in-difference model assumes that the trend in the comparison area is a reasonable substitute for the price trend we would have expected in Seattle, had Seattle not passed the Sweetened Beverage Tax. It is equivalent to subtracting the average change in prices over this time period in the comparison area from the average change in prices over this time period in Seattle. All beverage price results are presented as mean price per ounce to enable easy comparison of the pass-through to the price of the tax (1.75 cents per ounce), with the exception of syrup added to coffee beverages, as described above.

In addition, we calculated the **pass-through rate**, the percentage of the tax (1.75 cents per ounce) that is passed through to consumers (e.g., if a price goes up by 1.50 cents per ounce, this is 86% pass-through or $1.50/1.75*100$).

1A. AVERAGE OVERALL PASS-THROUGH WEIGHTED BY VOLUME SOLD AND STANDARDIZED TO THE FREQUENCY OF EACH STORE TYPE IN SEATTLE

To examine the average level of pass-through across beverage type and store type, we implemented a weighted average of price pass-through based on the volume of beverages purchased and standardized to the frequency of each store type in Seattle. This model estimates the weighted average price pass-through by reflecting the composition of beverage types and sizes typically purchased as well as the mix of store types in Seattle. This allows us to get an estimate that better reflects the price changes that customers would have experienced (i.e., more soda is purchased than energy drinks, so the price pass-through for soda is weighed more in the overall average pass-through estimate than the price

pass-through for energy drinks). We created weights using Nielsen retail scanner data² and a database of all Seattle food retail establishments. With these, we created weights that reflect the annual proportion of taxed beverage volume sold in Seattle stores for each beverage type, beverage size, and store type. We applied the weights to our difference-in-difference estimates of taxed beverage prices at baseline, before the tax, to two years post-tax. We present detailed methods for this analysis in **Appendix A**. In **Table A1** we present the full set of weights used in this estimation.

The **weighted average price pass-through two-years post-tax was 1.73 cents per ounce for Seattle versus comparison area stores, or 99% price pass-through**. We additionally estimated an unweighted average price pass-through for comparison. The unweighted price pass-through was moderately lower than the weighted estimate at 1.52 cents per ounce, or 87% pass-through rate (**Table 3**). We expected differences in the weighted versus unweighted estimates since our sample of stores and beverages was not designed to specifically be representative of volume of beverages sold.

For example, soda and juice drinks were more frequently purchased and had some of the highest pass-through rates compared to other beverages (see results below for beverage-type-specific pass-through results). Similarly, beverages purchased at drug/grocery stores, which had a higher pass-through rate than at other store types, comprised a larger proportion of beverage purchases than in our sample.

TABLE 3. AVERAGE CENTS PER OUNCE DIFFERENCE-IN-DIFFERENCE FOR SEATTLE AND COMPARISON AREA WEIGHTED BY BEVERAGE SALES VOLUME AND STORE TYPE

	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	% PASS- THROUGH TWO- YEARS POST-TAX
OVERALL PASS-THROUGH, WEIGHTED AVERAGE	1.73* (1.54, 1.91)	99%
OVERALL PASS-THROUGH, UNWEIGHTED AVERAGE	1.52* (1.32, 1.72)	87%

* $P \leq 0.05$

As an overall summary of tax pass-through, the weighted average has the advantage of reflecting the actual volume sold of different beverages and from different store types.

1B. AVERAGE PRICE CHANGES FOR TAXED BEVERAGES IN SEATTLE AND COMPARISON AREA TWO-YEARS POST-TAX

Next, we examine differences in average pass-through rates by beverage type and by store type. This analysis is limited to the same beverage over time, meaning we only include in the analysis beverages that were present in a given store, in their same size packaging, at both baseline and two years post-tax. The difference-in-difference estimates account for changes in beverage prices in the comparison area and control for price variations by store characteristics (store “fixed effects”), beverage type, and/or beverage size (**Table 4**).

² Researcher(s) own analyses calculated (or derived) based in part on data from The Nielsen Company (US), LLC and marketing databases provided through the Nielsen Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. The conclusions drawn from the Nielsen data are those of the researcher(s) and do not reflect the views of Nielsen. Nielsen is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

By beverage type.

In Seattle, the average price of most taxed beverage types increased significantly from baseline to two years post-tax. Across all taxed beverages, the change in price in Seattle from pre-tax to two years post-tax was 1.96 cents per ounce. Sweetened syrups added to barista-prepared coffee beverages in coffee shops was the only taxed beverage type that did not experience a statistically significant increase; the estimate of pass-through for this beverage increase was large but is in a different unit (i.e. price per shot vs price per ounce (+5.53 centers per shot)), and the variability was substantial. Sweetened syrups are included in our taxed category, however, their tax status is ambiguous, since retailers can provide a signed written statement to the distributor stating that the syrups will be added to drinks that have milk as their primary ingredient and the distributor will not be taxed for these syrups (Ord. 125324, § 2, 2017. Section 5.53.020).

In the comparison area, across all taxed beverages, the average price significantly increased from baseline to two years post-tax with an increase of +0.44 cents per ounce. For specific beverage types, the prices of soda, bottled tea, and bottled coffee also increased significantly from baseline to two years post-tax. The prices of sports and energy beverages had nearly statistically significant increases.

Estimates of price pass-through of the tax (difference-in-difference estimates). The proportion of the tax passed through to the consumer in Seattle versus the comparison area ranged from 42% to 91% by beverage type. The price of nearly all taxed beverages increased statistically significantly more in Seattle than the prices of similar beverage types in the comparison area, excepting sweetened syrups and bottled coffee beverages. Soda and juice drinks (not 100% fruit juice, which was not taxed) had the largest price pass-through rates at 91% price pass-through and all but one beverage type has pass-through rates above 85%; bottled coffee drinks had the lowest price pass-through at 42% (not statistically significant) (**Table 4**).

By store type.

In Seattle, the price of taxed beverages in all store types except coffee shops and warehouses increased statistically significantly from baseline to two years post-tax and was more than 1.75 cents per ounce on average. In coffee shops and warehouses, the estimated change was greater than 1.75 cents per ounce, but this was not statistically significant (our Seattle sample includes only one warehouse).

In the comparison area, from pre- to two-years post tax, we observed a statistically significant increase in prices of taxed beverages in supermarkets and superstores, small stores, and among quick service restaurants. There were non-statistically significant increases in prices among comparison area grocery stores/drug stores and coffee shops. In warehouses there was a non-statistically significant decrease in prices (our sample includes only one comparison area warehouse).

Estimates of price pass-through of the tax (difference-in-difference estimates). The price increases on taxed beverages in Seattle over and above the increase in the comparison area were statistically significant among superstores and supermarkets, grocery and drug stores, small stores, and quick service restaurants. In these store types, the statistically significant relative proportion of the tax (based on the difference-in-difference price increase between Seattle and the comparison area) passed through to the consumer ranged from 75% pass-through in small stores, to 110% pass-through in grocery and drug stores (1.31 cents per ounce and 1.93 cents per ounce, respectively).

Prices in warehouses and coffee shops increased relative to the comparison area but did not reach statistical significance (**Table 4**).

TABLE 4. CENTS PER OUNCE DIFFERENCE-IN-DIFFERENCE AND PERCENT PRICE PASS-THROUGH TWO-YEARS POST-TAX (UNWEIGHTED), LIMITED TO SAME BEVERAGES OVER TIME THAT WERE TAXED (OR WOULD BE TAXED IF DISTRIBUTED IN SEATTLE), INCLUDING STORE FIXED EFFECTS AND CONTROLLING FOR BEVERAGE/STORE TYPE

	SEATTLE DIFFERENCE, (95% CI)	COMPARISON DIFFERENCE, (95% CI)	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	PERCENT PRICE PASS- THROUGH	N OBSERVATIONS IN MODEL
TAXED BEVERAGES*:	1.96* (1.80, 2.12)	0.44* (0.32, 0.56)	1.52* (1.32, 1.72)	87%	10,478
SODA [†]	2.15* (2.00, 2.30)	0.55* (0.45, 0.65)	1.60* (1.42, 1.79)	91%	5,564
SPORTS BEVERAGES	1.68* (1.43, 1.93)	0.17+ (-0.01, 0.36)	1.50* (1.19, 1.82)	86%	1,274
ENERGY BEVERAGES	1.84* (1.50, 2.18)	0.30+ (-0.02, 0.62)	1.54* (1.08, 2.01)	88%	2,072
JUICE DRINKS	1.48* (1.03, 1.94)	-0.10 (-0.61, 0.40)	1.59* (0.90, 2.27)	91%	274
TEA, BOTTLED	1.81* (1.56, 2.07)	0.31* (0.10, 0.52)	1.51* (1.17, 1.84)	86%	796
SUGARY SYRUP ADD ON	5.53 (-6.06, 17.12)	2.95 (-7.14, 13.04)	2.59 (-12.78, 17.95)	N/A	68
COFFEE, BOTTLED	1.68* (0.98, 2.37)	0.94* (0.18, 1.70)	0.74 (-0.29, 1.77)	42%	498
STORE TYPE					
SUPERSTORES & SUPERMARKETS	1.85* (1.51, 2.19)	0.33* (0.13, 0.53)	1.52* (1.13, 1.91)	87%	3,048
GROCERY & DRUG STORES	2.08* (1.79, 2.36)	0.15 (-0.07, 0.37)	1.93* (1.57, 2.29)	110%	2,612
SMALL STORES	1.86* (1.61, 2.12)	0.56* (0.39, 0.73)	1.31* (1.00, 1.62)	75%	4,292
WAREHOUSES	1.10 (-1.88, 4.09)	-0.17 (-2.28, 1.94)	1.27 (-2.38, 4.93)	73%	30
COFFEE SHOPS**	5.53 (-6.06, 17.12)	2.95 (-7.14, 13.04)	2.59 (-12.78, 17.95)	N/A	68
QUICK SERVICE RESTAURANTS	2.64* (1.94, 3.34)	1.24* (0.64, 1.84)	1.40* (0.48, 2.33)	80%	496

*P≤0.05

[†]The average for all taxed beverages excludes the sugary syrup add-on from coffee shops since this estimate could not be confidently converted to price per ounce and instead is price per syrup shot, which is approximately 2-3 ounces). This estimated does include all fountain. However, we only collected one price for fountain drinks rather than collecting a 'soda' and 'diet soda' price. This is because most locations with fountain drinks charge by cup size rather than by the beverage type.

^{**}In coffee shops the only potentially taxed item we measured was the sugary syrup add-on. As mentioned above, the unit for this is price per shot, which is of varying size, rather than price per ounce.

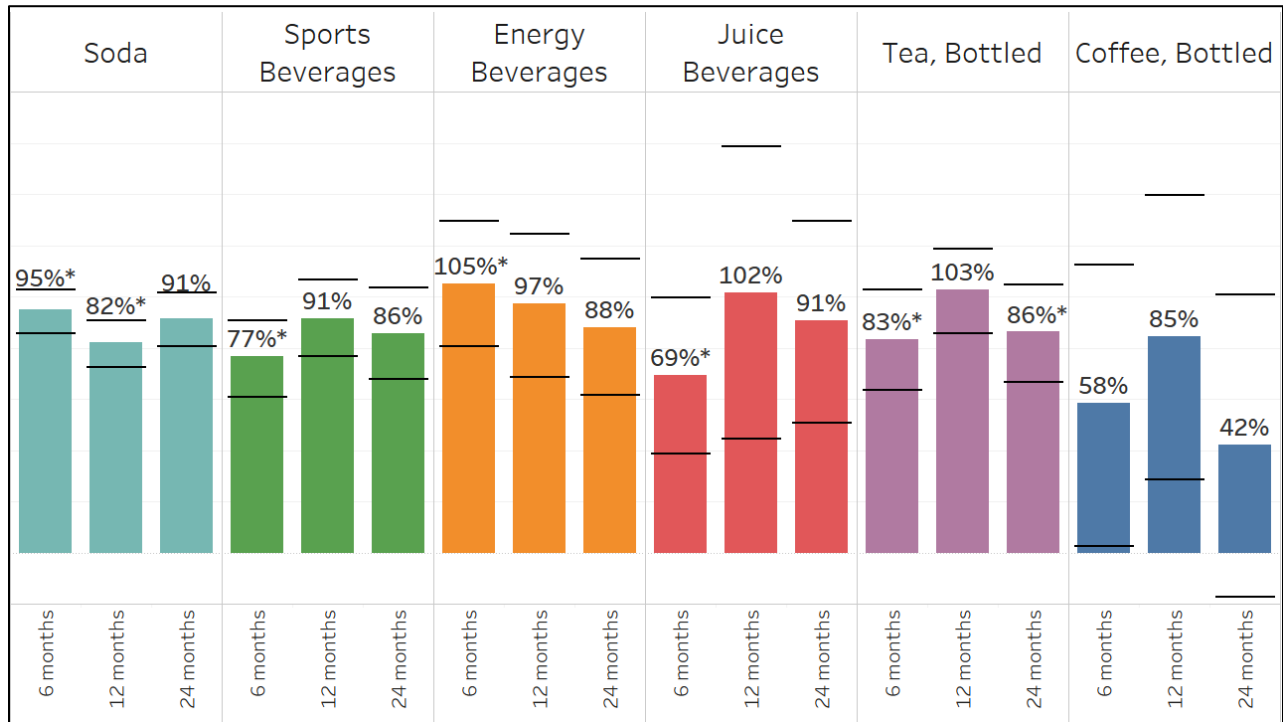
1C. COMPARISON OF PRICE PASS-THROUGH RESULTS OVER TIME

We assessed how the price pass-through changed over time by comparing the price pass-through in Seattle from six months, 12 months, and two years post-tax implementation (difference-in-difference estimates). The 12-month and two-year follow-ups are particularly useful comparisons because they occurred at the same time of year as the baseline data collection. Similar to our primary models, these statistical models are limited to the same beverages measured at each time point, controlling for store characteristics, beverage type and beverage size (**Figure 1**).

By beverage type.

When comparing pass-through rates by beverage type at six months, 12 months, and two years, we see that all beverages excepting bottled coffee had a significant change from baseline to six months, only soda changed statistically significantly from six months to 12 months (95% price pass-through to 82%). From 12 months to two years, only bottled tea drinks saw a statistically significant change (103% price pass-through to 86%). Most of the remaining beverages saw non-statistically significant price increases from six to 12 months, and then non-statistically significant price decreases from 12 months to two years. Energy drinks was the only beverage type which monotonically decreased across timepoints.

Figure 1. Price pass-through by beverage type in Seattle relative to baseline (pre-tax)



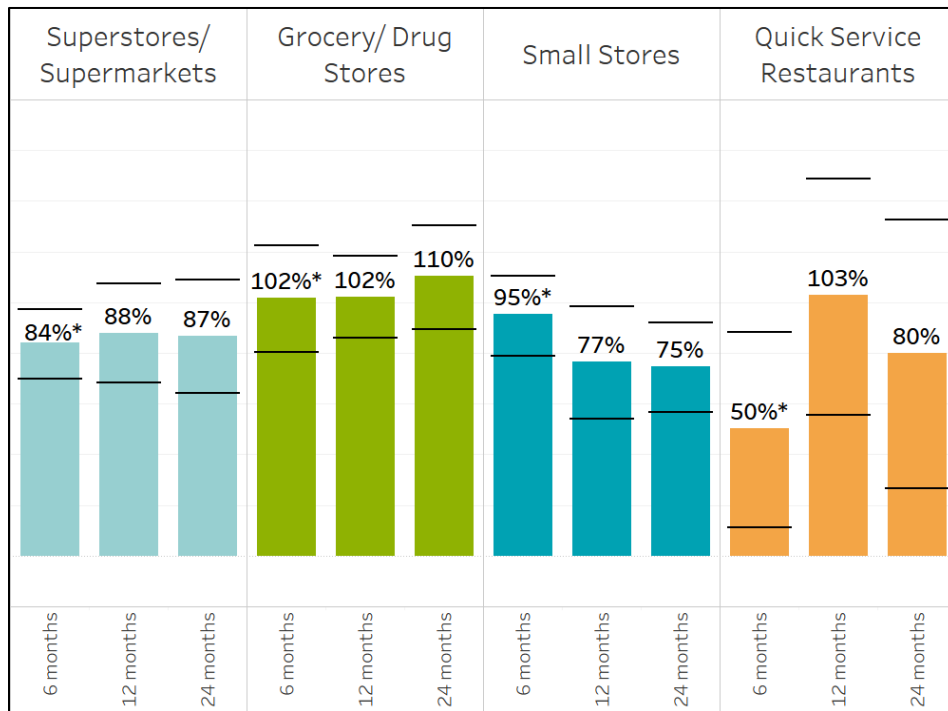
*P≤0.05

Figure note: The parallel bars indicate the 95% Confidence Interval. We have excluded the sweetened syrup add-on and coffee shops from the figure. Because the sweetened syrup add-on is measured as a ‘flavor shot’ rather than per ounce, the mean cents result is not directly comparable to the mean cents per ounce results of other beverages and store types.

By store type.

When comparing pass-through rates by store type at six months, 12 months, and two years, we see that all store types had significant price increases from baseline to six months, and then no price pass-through changes at 12 months and two years that were statistically significant (**Figure 2**). However, while not statistically significant, there was a seemingly sizable decrease in pass-through over time among small stores. This smaller pass through seems to be at least partially driven by small stores in the comparison area increasing prices of taxed beverages (0.56 cents per ounce) over this time period (**Table 4**).

Figure 2. Price pass-through for taxed beverages by store category in Seattle



* $P \leq 0.05$

Figure note: The parallel bars indicate the 95% Confidence Interval. We have excluded coffee shops from the figure because in coffee shops we only measured prepared beverages, and the sugary syrup 'flavor shot.'

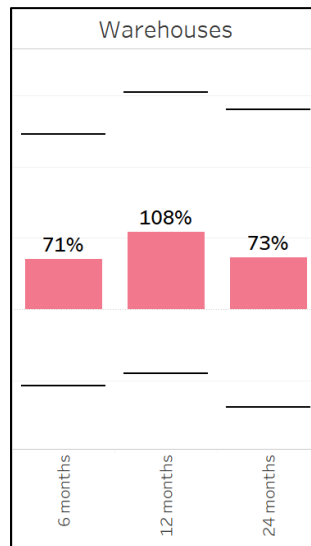


Figure note: Because our warehouse sample has only two stores, there are large price variations and wide confidence intervals.

1D. STORES NEAR SEATTLE BORDER

The tax may affect beverage prices in stores near the Seattle border differently than in other stores due to potential for competition of border stores with stores in close proximity that are not in Seattle, the taxed jurisdiction. Other cities with beverage taxes (Berkeley and Philadelphia) report that pass-through tends to be lower in stores closer to the city border. To explore whether this was the case in Seattle, we examined prices of beverages in 35 Seattle stores that were within one mile of the southern and northern border of the city and compared the price changes in these stores to the price changes in the comparison area stores (**Table 5**) (note that the west and east borders are not included given that

they are bodies of water). We found that, indeed, on average, pass-through was lower in stores close to the border (64% tax price pass-through) than the Seattle citywide unweighted average (87% tax price pass-through). The price change difference was markedly smaller for non-taxed beverages (see **Appendix D** for Seattle and comparison area estimates).

TABLE 5. THE ESTIMATED IMPACT OF THE TAX TWO-YEARS POST-TAX (DIFFERENCE-IN-DIFFERENCE) AMONG STORES WITHIN 1 MILE OF SEATTLE’S NORTHERN OR SOUTHERN BORDER COMPARED TO ALL STORES IN THE COMPARISON AREA

	DIFFERENCE OF DIFFERENCES, CENTS/OZ. (95% CI)	PASS-THROUGH RATE TWO-YEARS POST-TAX, THE PERCENT OF THE 1.75 CENTS/OZ. PASSED TO CONSUMERS	NUMBER OF BEVERAGES IN ANALYSIS
TAXED BEVERAGES	1.12* (0.76, 1.48)	64%	6,446
NON-TAXED BEVERAGES	0.03 (-0.17, 0.23)	--	6,598

* $P \leq 0.05$

1E. PASS THROUGH BY DRINK SIZE

We also investigated price pass-through by beverage size, and separately, for fountain drinks. Pass-through was 80% on individual-sized beverages, 87% on 2 Liters, and 97% on 12 packs (**Table 6**).

TABLE 6. CENTS PER OUNCE DIFFERENCE-IN-DIFFERENCE FOR SEATTLE AND COMPARISON AREA FOR TAXED BEVERAGES BY BEVERAGE SIZE

	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	% PASS- THROUGH	N OBSERVATIONS IN MODEL
20 OZ TAXED BEVERAGES	1.40* (1.11, 1.70)	80%	1,866
2-LITER TAXED BEVERAGES	1.52* (1.30, 1.74)	87%	1,318
12 PACK (144 OZ) TAXED BEVERAGES	1.69* (1.39, 1.99)	97%	908

* $P \leq 0.05$

In quick service restaurants fountain drinks had a 77% price pass-through, and fountain drinks in food stores (e.g., supermarkets, superstores, grocery) had 50% price pass-through (**Table 7**). Note that we only collected one price for fountain drinks rather than collecting separate regular soda and diet soda prices. This is because most locations with fountain drinks charge by cup size rather than by the beverage type and the combination of beverages taxed and untaxed within fountain drinks and their distribution may explain the lower pass-through values observed for fountain drinks.

TABLE 7. CENTS PER OUNCE DIFFERENCE-IN-DIFFERENCE FOR SEATTLE AND COMPARISON AREA FOR FOUNTAIN DRINKS BY STORE TYPE

	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	% PASS-THROUGH	N OBSERVATIONS IN MODEL
QUICK SERVICE FOUNTAIN DRINKS	1.34+ (-0.05, 2.72)	77%	236
FOOD STORE FOUNTAIN DRINKS	0.88* (0.16, 1.60)	50%	448

* $P \leq 0.05$; + $P \leq 0.10$

1f. INCLUDING ALL BEVERAGES, NOT LIMITING TO SAME BEVERAGE OVER TIME

Our tax impact results presented above (both weighted and unweighted) include only beverages that were measured at both baseline and two years after tax implementation. In **Appendix E** we present the unweighted results when including all beverage prices that were measured, regardless of whether or not a beverage is observed at both time points. The results not limited to the same beverage over time reflect the average change in prices faced in stores and restaurants by consumers in our sampled beverages at baseline and the 24-month follow-up (rather than the price change experienced when purchasing one specific beverage in a store). These findings are largely similar to results presented above.

QUESTION 2 RESULTS | DID WE SEE CHANGES IN PRICE FOR NON-TAXED BEVERAGES?

In addition to investigating whether the tax affected prices of beverages subject to the tax, we examined whether the tax was associated with changes in the price of beverages not subject to the tax two years post-tax (**Table 8**).

In Seattle the prices of four non-taxed beverages increased above and beyond changes seen in the comparison area. Specifically, the price of diet soda (0.39 cents), diet sports beverages (0.41 cents), powdered sugar-free drink mixes (0.07 cents), and powdered sugary drink mixes (0.18 cents) increased significantly. The price of prepared sugar-free coffees had a large, but only marginally statistically significant increase (1.72 cents).

When looking by store, we saw statistically significant increases in the price of non-taxed beverages among supermarkets/superstores (0.16 cents per ounce) and small stores (0.39 cents per ounce).

TABLE 8. CENTS PER OUNCE DIFFERENCE-IN-DIFFERENCE AND PRICE PASS-THROUGH TWO-YEARS POST-TAX, LIMITED TO SAME BEVERAGES OVER TIME, INCLUDING STORE FIXED EFFECTS AND CONTROLLING FOR BEVERAGE/STORE TYPE

	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	N OBSERVATIONS IN MODEL
NON-TAXED NON-SUGARY BEVERAGES:	0.20* (0.01, 0.39)	10,278
DIET SODA	0.39* (0.13, 0.65)	3,728
DIET SPORTS BEVERAGES	0.41* (0.06, 0.77)	568
DIET ENERGY BEVERAGES	0.06 (-0.75, 0.86)	1,706
100% JUICE	0.36 (-0.29, 1.00)	458

MILK	-0.07 (-0.21, 0.07)	1,992
WATER	-0.03 (-0.33, 0.27)	946
POWDERED SUGAR FREE	0.07* (0.02, 0.13)	226
TEA, BOTTLED SUGAR FREE	0.19 (-0.26, 0.64)	476
COFFEE, SUGAR FREE PREPARED	1.72+ (-0.30, 3.73)	178
SUGAR FREE SYRUP ADD ON*	9.91 (-10.74, 30.56)	56
NON-TAXED SUGARY BEVERAGES:	0.21 (-0.18, 0.61)	1,184
CHOCOLATE MILK	-0.10 (-0.56, 0.37)	536
POWDERED SUGAR ADDED	0.18* (0.09, 0.27)	510
COFFEE, PREPARED (E.G., SWEETENED LATTES)	1.82 (-0.81, 4.44)	138
STORE TYPE		
SUPERSTORES/SUPERMARKETS	0.16* (0.03, 0.30)	4,132
GROCERY/DRUG STORES	0.16 (-0.16, 0.48)	3,204
SMALL STORES	0.39* (0.03, 0.74)	3,482
WAREHOUSES	-0.03 (-0.53, 0.46)	64
COFFEE SHOPS	1.61 (-0.47, 3.69)	248
QUICK SERVICE RESTAURANTS	0.64 (-0.33, 1.62)	264

* $P \leq 0.05$; + $P \leq 0.1$

**In coffee shops the only potentially taxed item we measured was the sugary syrup add-on. The unit for this is price per shot, which is of varying size, rather than price per ounce.*

LIMITATIONS

This study has limitations that should be noted. Although we surveyed a large sample of beverages and beverages of various sizes, we did not measure all beverages. Additionally, while we include a large number of stores in Seattle and our comparison area, we have only a sample of stores rather than a census of all stores; however, based on input from the SBT CAB, in addition to the sampling of stores for geographic balance, we additionally sampled minority-owned business (using City of Seattle ‘Women- and Minority-Owned Business’ lists), and worked with community liaisons to survey Somali- and Hispanic-owned stores. We did not include some popular grocery stores such as Whole Foods, Trader Joe’s, and PCC because these stores devote relatively little shelf space to sugary beverages. We were not able to survey a prepared coffee beverage that would be always subject to the tax, since beverages at coffee shops that contain sugary syrup also tend to have milk as the primary ingredient and are therefore eligible for exemption from the tax. We were unable to resurvey any bubble tea stores in the comparison area, and as a result they are not included in this analysis.

SUMMARY AND CONCLUSIONS

Two years after the implementation of Seattle’s Sweetened Beverage Tax, we continue to observe generally high and consistent pass-through of the price of the tax to consumers in the city of Seattle. Using the beverage-volume-weighted average, we found nearly 99% pass-through of the tax at two-years post-tax after accounting for the change in prices in comparison area stores and restaurants not subject to the tax. We found statistically significant price increases in all

beverage categories, except sweetened syrup added to coffee (which has an ambiguous tax status) and bottled coffees, and in most store types. When looking at specific beverage types, we found that pass-through ranged from 42% (bottled coffee) to 91% (soda and juice drinks). Pass-through was statistically significant for each store type in Seattle relative to the comparison area and ranged from 75% in small stores to 110% in grocery and drug stores. Average pass-through in supermarkets was 87%. We found that pass-through was lower on average among stores within one mile of the northern or southern border of Seattle.

By beverage size, pass-through was 80% on individual- sized beverages, 87% on 2 Liters, and 97% on 12 packs; fountain drinks in Seattle had marginally significant price increases above and beyond increases in the comparison area in quick service restaurants, and significant increases in food stores (77% pass-through). There were some non-taxed beverage price increases in Seattle relative to the comparison area, although this was less consistent across beverage and store types, and the magnitude of these difference-in-difference price increases were markedly lower than for taxed beverages (most <25%).

Comparing the short-term (6-month), medium-term (12-month), and long-term (two years), we saw few significant price changes from the original six month pass-through.

In a companion report on store revenues, we examine whether there has been any detectable change in small store revenue in association with the timing of the tax, finding no evidence of a loss of gross revenue among Seattle stores. While the non-chain small stores included in the current report would also be included in the study of store revenues, the study samples are not the same—the report on store revenues excludes chain stores and focuses only on small stores—so, it is difficult to directly compare conclusions across reports.

Taken together, the results presented herein suggest that the increased prices of taxed beverages in Seattle relative to the comparison area have been substantial and sustained in the long-term.

APPENDIX A | METHODS

Sample.

To obtain our sample of stores at baseline (pre-tax implementation), first we identified all food stores in Seattle and our comparison area based on a list of all permitted, permanent food establishments in 2016, maintained by Public Health Seattle King County (PHSKC). The Urban Form Lab at the University of Washington previously created algorithms to classify each of these businesses into meaningful food store or restaurant categories (supermarkets, grocery stores, corner stores, counter-service restaurants, etc.). Store definitions are provided in **Appendix B**. We used this classification to initially categorize stores and restaurants and then updated the category as necessary when we visited each store or restaurant. Recategorization of stores happened infrequently; in a validation study of a subsample of stores, we found that only one out of 80 stores had a different store type when assessed in-person than as was listed in the categorized food establishments list.

We aimed for a geographically balanced sample of food stores (supermarkets, grocery stores, corner stores, gas stations), coffee shops, and counter-service restaurants in Seattle and in the comparison area (Federal Way, Kent, and Auburn). At baseline, when selecting our store sample, we obtained geographic balance by dividing our study areas into 16 equal-sized areas, geocoding all the food establishments, then selecting a quota of stores from each store type within each of the 16 areas.

In addition to the sample derived from the above process, we also worked with community liaisons and used “minority-owned business” lists to oversample small stores and counter-service restaurants owned by people of color; we included this additional community-based sampling approach due to the expressed interest of the City of Seattle and the Community Advisory Board in ensuring these stores were represented in the sample.

During the two-year follow up survey, we revisited every store included in the baseline sample (that we had not identified as closed during the 6- or 12-month surveys) and attempted to re-survey the prices of select beverages in each store.

Data collectors attended one six-hour training, then practiced data collection in the field until achieving 90% raw agreement on responses. We conducted all in-store audits between October 23 and November 22, 2017 for the pre-tax, baseline assessment. The six-month, post-tax follow-up audits were conducted between May 21 and July 20, 2018. The 12-month, one-year post-tax follow-up audits were conducted between October 15 and November 16, 2018. The two-year post-tax follow-up audits were conducted between October 18 and November 21, 2019. Consistent with our baseline and 12-month data collection methodology we completed the two-year data collection prior to the Thanksgiving holiday to minimize capturing holiday-specific sales.

Data collection.

Within each store we measured the availability and prices of: soda, sports and energy drinks, teas and coffees, juices, powdered drink mixes, water, milks, fountain drinks, and a handful of snack and sugary foods. **Appendix C** shows all surveyed beverages by beverage type and beverage tax category. For each beverage listed, we recorded the pricing and availability of multiple standard packaging sizes (e.g. 12oz cans, 20oz bottles, 1-liter bottles, 12 packs of 12oz cans).

Variables.

Exposure Variable

Our exposure of interest is the Seattle Sweetened Beverage Tax, which was implemented beginning on January 1, 2018 and was imposed on distributors selling targeted beverages to stores and restaurants inside the City of Seattle. We consider beverages as subject to the tax if they are measured inside Seattle stores or restaurants after January 1, 2018. Our primary analysis focuses on beverage prices collected approximately two years after tax implementation (October - November 2019). In secondary analyses, we test whether the impact of the tax was different in the short term (six months post-tax), compared to the medium-term 12 months post-tax, and the long-term two years post-tax. We additionally examine whether the prices of non-taxed beverages change in association with the tax.

Outcome Variables

The primary outcome of interest was the price of beverages subject to the tax, which we express as cents per ounce. We collected regular and discounted prices for all surveyed beverages. For these analyses, we use the lowest price at which each beverage could have been purchased on the day the store was surveyed. We additionally examine prices of beverages that are not subject to the tax.

Statistical Models and Covariates

We present four sets of models. The first three models we present we consider our primary analyses; the fourth model we present is our secondary analysis.

First, we present a volume-weighted model that is an overall average model weighted by the volume of beverage purchases for aggregate beverage types in selected store types and additionally weighted to be representative of the store type distribution in the City of Seattle (further details provided below). This model estimates the weighted average price pass-through by reflecting the composition of beverage types and sizes typically purchased as well as the mix of store types in Seattle. We fit this model because price pass-through varies by beverage type, beverage size, and store type, and our retail audit sample is not a representative sample of beverage purchases in Seattle and the comparison area (i.e., not all beverages are purchased equally). This model also controls for store fixed effects.

We created the weights in two steps. First, we used retail scanner data on beverage purchases in Seattle in 2018 from The Nielsen Company (US), LLC to calculate the volume sold of taxed beverages for each beverage type, size, and store type included in our retail audit.³ Second, we standardized the sales volume for each category to the distribution of store types in Seattle. A list of all 2016 permitted, permanent food establishments from Public Health - Seattle & King County (PHSKC), categorized by the Urban Form Lab at the University of Washington, served as the universe of Seattle stores to which we standardized the volume sold. The final weights reflected the proportion of the total volume sold for each of the following categories: beverage type (soda, sports, energy, juice drinks, bottled tea, and bottled coffee), beverage size (single, multi-pack), and store type (small stores [convenience and gas stations], drug stores, and large stores [grocery, supermarkets, superstores, and warehouses]). We did not include fountain drink purchases in the calculation of the weights because they are not captured in the Nielsen retail data set, nor did we include sugary syrup because of ambiguity around its tax status in prepared beverages.

See **Table A1** below for the weights used to estimate volume-weighted pass-through.

Next, we fit an overall, unweighted average model. This model controls for store “fixed effects” (i.e., an indicator variable for each store to control for time-fixed store characteristics), beverage type, and beverage size. **Second, we present this model stratified by beverage type**, which control for store fixed effects and beverage size. **Third, we present this model stratified by store type**, which control for store fixed effects, beverage type, and beverage size.

In our first three models, we included five different categories of stores or restaurants: Superstores and supermarkets, grocery stores and drug stores, small stores, counter-service restaurants, and beverage shops (coffee or tea). Definitions for each store or restaurant type are provided in **Appendix B**. We present models that control for store type (using fixed effects) as well as models that stratify by store type to examine heterogeneity in the degree of pass-through by store type. Our primary analyses are limited to the same beverage over time, meaning we only include in the analysis beverages that were present in their same packaging size in a given store at both baseline and two-years.

Our secondary analyses, and **the fourth models we present, include all beverages measured at both timepoints.**

³Researcher(s) own analyses calculated (or derived) based in part on data from The Nielsen Company (US), LLC and marketing databases provided through the Nielsen Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. The conclusions drawn from the Nielsen data are those of the researcher(s) and do not reflect the views of Nielsen. Nielsen is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein.

Statistical Analysis.

Primary analyses (Models 1-3). Our primary analyses aim to estimate the impact of the tax on the price of beverages subject to the tax. To do this, we use a regression-based difference-in-difference model to estimate the degree to which the price of beverages in Seattle changed above and beyond price changes for the same beverages in the comparison area from baseline to two years later. We do this for taxed beverages and non-taxed beverages. Specifically, we ran ordinary least squares models with standard errors adjusting for clustering at the store level of the general form:

$$Y_{it} = \beta_0 + \beta_1(\text{city})_i + \beta_2(\text{time})_t + \beta_3(\text{cityXtime})_{it} + \varepsilon_{it},$$

where, Y_{it} is the price per ounce of beverage i at time t . $City$ is an indicator variable that takes the value of 1 for observations in Seattle and 0 for observations in the comparison area; this controls for baseline differences in prices between Seattle and the comparison area. $Time$ is an indicator variable that takes the value of 1 for prices measured in the post-tax period and 0 for prices measured in the pre-tax period; this controls for the time trend we could have expected to see had Seattle not implemented the tax. The coefficient on the interaction between $city$ and $time$ ($cityXtime$), β_3 , is the difference-in-difference estimator. It estimates the average change in prices in Seattle above and beyond the change in prices in the comparison area and is our estimate of the impact of the tax on the prices of taxed beverages. This is also our estimate of the tax pass-through. A pass-through of the tax of 100% would mean $\beta_3 = 1.75$, meaning that the price of beverages subject to the tax rose an additional 1.75 cents per ounce (the actual magnitude of the tax on distribution of sugary beverages in Seattle) above and beyond the change seen in the comparison area.

Weighted analysis (Model 1). In the analysis weighted by beverage purchases in each store type, we ran difference-in-difference models stratified by beverage type, beverage size, and store type. We multiplied each estimate by its corresponding volume-based weight to create a single, weighted average pass-through estimate. We ran this model for taxed beverages only.

Stratified analyses (Models 2 and 3). Using these same difference-in-difference models, we then ran models stratified by beverage type and store type, since previous studies have noted different pass-through of the tax by beverage and store type. We did this for both taxed and non-taxed beverages, separately.

In all models, we include only stores that we surveyed at both time points. Our primary models are limited to include only beverages that were measured at both time points in a store. In our secondary analyses, Model 4, we examine all beverages that were surveyed in these stores at either time point. Additionally, we 1) used difference-in-difference models by beverage size to identify how prices changed in association with the tax by beverage size, and 2) limited the Seattle sample to stores within one mile of the North or South border to understand the impact of the tax on border stores.

	Convenience stores (fl oz)				Drug stores (fl oz)				Large stores (fl oz) [mass merch and food retail]**			
	Total volume sold in Nielsen	Volume sold per store in Nielsen (volume / 5 stores)	Expected volume sold in Seattle universe (vol*298 stores)	Proportion expected total volume (final weight)	Total volume sold in Nielsen	Volume sold per store in Nielsen (vol / 35)	Expected volume sold in Seattle universe (vol*44)	Proportion expected total volume (final weight)	Total volume sold in Nielsen	Volume sold per store in Nielsen (vol / 57 stores)	Expected volume sold in Seattle universe (vol*151)	Proportion expected total volume (final weight)
Soda												
Single	1,627,355	325,471	96,990,358	0.0413	12,177,074	347,916	15,308,322	0.0065	113,742,537	1,995,483	301,317,950	0.1282
Multipack	62,720	52,544	15,658,112	0.0067	6,743,161	192,662	8,477,117	0.0036	169,552,627	2,974,607	449,165,732	0.1911
Energy beverage												
Single	1,143,958	228,792	68,179,879	0.0290	2,062,726	58,935	2,593,142	0.0011	17,789,073	312,089	47,125,439	0.0201
Multipack	10,725	2,145	639,198	0.0003	218,862	6,253	275,141	0.0001	3,219,501	56,482	8,528,853	0.0036
Juice drinks												
Single	33,323	106,665	31,786,051	0.0135	-	-	-	-	194,156,834	3,406,260	514,345,297	0.2189
Multipack	-	-	-	-	413,688	11,820	520,065	0.0002	28,564,120	501,125	75,669,862	0.0322
Sports beverage												
Single	2,318,200	463,640	138,164,720	0.0588	8,810,165	251,719	11,075,636	0.0047	80,915,134	1,419,564	214,354,127	0.0912
Multipack	-	-	-	-	-	-	-	-	50,724,960	889,912	134,376,648	0.0572
Tea, bottled												
Single	494,893	98,979	29,495,599	0.0126	8,081,131	230,889	10,159,136	0.0043	42,558,988	746,649	112,743,986	0.0480
Multipack	-	-	-	-	-	-	-	-	-	-	-	-
Coffee, bottled												
Single	10,052	62,010	18,479,081	0.0079	1,138,184	32,520	1,430,860	0.0006	14,111,556	247,571	37,383,245	0.0159
Multipack	-	-	-	-	161,240	4,607	202,701	0.0001	2,167,562	38,027	5,742,139	0.0024
Total*	6,701,225	1,340,245	399,392,998	0.1699	39,806,231	1,137,321	50,042,119	0.0213	717,502,893	12,587,770	1,900,753,278	0.8088

**According to Nielsen retail channel codes

APPENDIX B | STORE DEFINITIONS

SBT Retail Audit Store Type Definitions

Grocery & Food Stores

1) Warehouse – Warehouses carry a wide array of products usually including clothing, household items, and often children’s items such as toys. Warehouses specialize in bulk size products. The only warehouse in our sample is Costco.

2) Supermarket and Superstore – To qualify as a supermarket, the store must 1) sell fresh meat (uncooked, unprocessed, not frozen meat, not fish/seafood, not packaged deli meat), 2) have four or more cash registers (including self-checkout), and 3) have at least two of the following services: butcher, bakery and/or deli. The butcher, bakery and deli must be staffed service counters (i.e., availability of fresh bread and/or fresh meat does not count if there is not a separate, staffed service counter). Examples of supermarkets include Safeway, QFC, and Metropolitan Market. Superstores carry a wide array of products usually including clothing, household items, and often children’s items such as toys. Some general merchandize stores may also have a grocery or supermarket within the store. Examples include Target and Walmart.

3) Grocery Store – To qualify as a grocery store, the store must 1) sell fresh meat (uncooked, unprocessed, not frozen meat, not fish/seafood, not packaged deli meat) and 2) not meet all of the criteria for being a supermarket. Examples of grocery stores include Red Apple, Pioneer Square Market, Viet-Wah, and some ethnic and “mom-and-pop” food stores.

4) Drug Stores – This includes stores that sell prescription and over the counter medication, as well as additional merchandise including food and beverages. Examples include Walgreens, CVS, and Rite Aid. Note: in analyses we combine drug stores with grocery stores.

5) Small Stores – Store types a-d qualify as “small stores.” These stores do not sell fresh meat. They may, but typically do not, have deli and/or bakery service counters. Please note there should not be butcher or fresh meat service counters and this is why they are identified as small stores.

a. Chain Convenience – This includes small chain stores that sell an edited selection of staple groceries and other convenience items, i.e., ready-to-heat and ready-to-eat foods. They often sell fresh milk and may have a deli or sell some processed meats (hot dogs, cold cuts, etc.) and other hot foods. Convenience stores are typically open long hours. Examples of convenience stores are 7-Eleven and Plaid Pantry. In this study, based on pre-screening, we will indicate chain versus non-chain status for field workers.

b. Non-Chain Convenience – This includes small, independently-owned stores that sell an edited selection of staple groceries and other convenience items, i.e., ready-to-heat and ready-to-eat foods. They often sell fresh milk and may have a deli or sell some processed meats (hot dogs, cold cuts, etc.) and other hot foods. Convenience stores are typically open long hours. Please note that corner stores will also be classified as non-chain convenience stores. Examples include Union Market, and many ethnic and “mom and pop” stores.

c. Discount Store – This includes small stores that sell a variety of goods like household, personal, and party supplies and household cleaning products, as well as some food and beverages, typically at discounted prices. We will include stores that have the word “dollar” or “discount” in the title. Examples include Dollar General and Dollar Tree.

d. Gas Station – This includes the quick-stop shops at gas stations. Gas station shops sell a selection of snacks, beverages, convenience items, and ready-to-heat and ready-to-eat foods. They may sell a selection of staple groceries. To be a gas station store, these stores must have gas pumps connected to the store. A few stores, such as 7-11s, can be both “gas stations” and “chain convenience stores.” The distinction is the presence of gas pumps. Examples include AMPM, 76, or Shell.

6) Quick Service (fast food) restaurants

a. Quick Service Chain – A restaurant that serves fast food cuisine and has minimal table service. Food is usually offered from a limited menu, cooked or prepped in bulk in advance and kept hot, finished and packaged to order, and usually available for take away, though seating may be provided. “Fast casual” are also included in this category, and tend to have more seating, and food items that are made-to-order. “Chain” quick-service refer to national fast-food brands (e.g., McDonalds, Dairy Queen, Taco Bell).

b. Quick Service Non-Chain – A restaurant that serves fast food cuisine and has minimal table service. Food is usually offered from a limited menu, cooked in bulk in advance and kept hot, finished and packaged to order, and usually available for take away, though seating may be provided. “Fast casual” are also included in this category and tend to have more seating as well as food items that are made-to-order. “Non-chain” quick-service refers to chains that are not national chains / brands. Local chains (e.g., Dicks, Pagliacci Pizza) are included in this category.

7) Beverage Shops

a. Coffee Shop – A small café that serves primarily coffee as well as other drinks. Usually but does not have to serve simple foods. Can be a separate building, or inside of a larger store or restaurant. Can be a drive-thru or a walk-in café. If it is a drive-thru only coffee stand, only survey if the coffee stand has a menu that is visible to the exterior. If there is no exterior menu, do not survey the shop.

b. Bubble Tea Shop – A small café that serves primarily bubble tea as well as other drinks, including coffee. Can serve simple food. Can be a separate building, or inside of a larger store or restaurant. *Note: We were unable to resurvey any bubble tea stores in the comparison area at two-years post-tax, and as a result they are not included in this two-year analysis.*

APPENDIX C | SURVEYED BEVERAGE TYPES AND BEVERAGE TAX STATUS

ALL SURVEYED BEVERAGES BY BEVERAGE TYPE AND BEVERAGE TAX STATUS ¹		
TAXED BEVERAGES (N=25)	NON-TAXED SUGAR-FREE BEVERAGES (N=32)	NON-TAXED SUGAR-SWEETENED BEVERAGES (N=9)
SODA	DIET SODA	CHOCOLATE MILK
COCA COLA DR. PEPPER FANTA JARRITOS MOUNTAIN DEW PEPSI SODA, LOWEST COST AVAILABLE	COCA COLA ZERO COCA COLA DIET DR. PEPPER DIET MOUNTAIN DEW DIET PEPSI DIET JARRITOS LIGHT	CHOCOLATE MILK, ALL FAT CONTENTS
JUICE DRINK	JUICE 100%	POWDERED DRINKS
CAPRISUN TROPICANA FRUIT TWIST DRINK KIRKLAND CRANBERRY JUICE COCKTAIL KOOL-AID MINUTE MAID CRANBERRY JUICE COCKTAIL MINUTE MAID FRUIT PUNCH TROPICANA CRANBERRY JUICE COCKTAIL JUICE DRINK, LOWEST COST AVAILABLE	CAPRISUN 100% JUICE KIRKLAND APPLE 100% JUICE KIRKLAND ORANGE 100% JUICE MINUTE MAID ORANGE 100% JUICE TROPICANA ORANGE 100% JUICE TREETOP APPLE 100% JUICE	GATORADE G2 GATORADE CHOCOLATE MILK COUNTRY TIME LEMONADE KOOL-AID
SPORTS DRINK	DIET SPORTS DRINK	BUBBLE TEA PREPARED
GATORADE POWERADE VITAMIN WATER	POWERADE ZERO VITAMIN WATER ZERO GATORADE G2	BUBBLE TEA SWEETENED, MILK-BASED
ENERGY DRINK	DIET ENERGY DRINK	COFFEE PREPARED
MONSTER ENERGY DRINK RED BULL ENERGY DRINK	MONSTER ENERGY DRINK ZERO RED BULL ENERGY DRINK SUGAR-FREE	COFFEE LATTE SWEETENED COFFEE MOCHA
TEA BOTTLED	WATER	
ARIZONA TEA PURE LEAF TEA	LA CROIX WATER	
TEA PREPARED	MILK	
BUBBLE TEA, NON-MILK BASED	WHITE MILK, ALL FAT CONTENTS	
COFFEE BOTTLED	POWDERED DRINKS, SUGAR-FREE	
STARBUCKS FRAPPUCCINO	CRYSTAL LITE LEMONADE KOOL-AID CHOCOLATE MILK	
SUGARY FLAVOR SHOT*	TEA BOTTLED	
	ARIZONA TEA, UNSWEETENED PURE LEAF TEA, UNSWEETENED	
	BUBBLE TEA PREPARED	
	BUBBLE TEA, SUGAR-FREE BUBBLE TEA, UNSWEETENED TEA FRUIT SMOOTHIE	
	COFFEE PREPARED	
	COFFEE, DRIP COFFEE, LATTE PLAIN COFFEE, LATTE SUGAR-FREE FLAVORED	
	SUGAR-FREE FLAVOR SHOT*	

¹ For each beverage listed, we measured the pricing and availability of multiple packaging sizes (e.g., 12oz cans, 20oz bottles, 1-liter bottles, 12 packs of 12oz cans)

*Sugary syrup add-on has ambiguous tax status; the sugary syrup add-on is sold in most coffee shops as a one-ounce beverage add-on (e.g., 'vanilla latte'). We include this one-ounce syrup 'shot' as a separate beverage type in our analyses.

APPENDIX D | THE ESTIMATED IMPACT OF THE TAX TWO-YEARS POST-TAX (DIFFERENCE-IN-DIFFERENCE) AMONG STORES WITHIN 1 MILE OF SEATTLE’S NORTHERN OR SOUTHERN BORDER COMPARED TO ALL STORES IN THE COMPARISON AREA

	SEATTLE DIFFERENCE, (95% CI)	COMPARISON DIFFERENCE, (95% CI)	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	PERCENT PRICE PASS- THROUGH	N OBSERVATIONS IN MODEL
TAXED BEVERAGES	1.56* (1.22, 1.90)	0.44* (0.32, 0.55)	1.12* (0.76, 1.48)	64%	6446
NON-TAXED BEVERAGES	0.41* (0.25, 0.58)	0.38* (0.27, 0.50)	0.03 (-0.17, 0.23)	--	6598

* $P \leq 0.05$

APPENDIX E | PRICE PASS-THROUGH, ALL BEVERAGED MEASURED, CONTROLLING FOR STORE DIFFERENCES

TAXED BEVERAGES

The unweighted difference-in-difference in cents per ounce of **all taxed beverages** in Seattle and the comparison area at baseline and two-years post-tax. This table includes all beverages measured, and controls for store fixed effects, and beverage category or store type.

	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	% PASS-THROUGH	N OBSERVATIONS IN MODEL
TAXED BEVERAGES	1.66* (1.44, 1.88)	95%	12,638
SODA	1.71* (1.50, 1.92)	98%	6,889
SPORTS BEVERAGES	1.54* (1.19, 1.89)	88%	1,549
ENERGY BEVERAGES	1.54* (0.97, 2.10)	88%	2,342
JUICE DRINKS	1.68* (1.02, 2.33)	96%	351
TEA, BOTTLED	1.76* (1.36, 2.17)	101%	941
SWEETENED SYRUP ADD-ON	2.59 (-12.68, 17.85)	--	72
COFFEE, BOTTLED	0.75 (-0.26, 1.77)	43%	566
STORE TYPE			
SUPERSTORES / SUPERMARKETS	1.53* (1.14, 1.92)	87%	3,300
GROCERY / DRUG STORES	2.08* (1.66, 2.51)	119%	3,144
SMALL STORES	1.57* (1.22, 1.92)	90%	5,512
WAREHOUSES	2.20 (-0.92, 5.31)	126%	39
COFFEE SHOPS	2.59 (-12.68, 17.85)	148%	72
QUICK SERVICE RESTAURANTS	1.82 (0.78, 2.86)	104%	643

* $P \leq 0.05$

NON-TAXED BEVERAGES

The unweighted difference-in-difference in cents per ounce of **all non-taxed beverages** in Seattle and the comparison area at baseline and two-years post-tax. This table includes all beverages measured, and controls for store fixed effects, and beverage category or store type.

	DIFFERENCE OF DIFFERENCES CENTS/OZ, (95% CI)	N OBSERVATIONS IN MODEL
NON-TAXED NON-SUGARY BEVERAGES:	0.30* (0.10, 0.50)	12,659
DIET SODA	0.49* (0.23, 0.76)	4,582
DIET SPORTS BEVERAGES	0.15 (-0.23, 0.54)	748
DIET ENERGY BEVERAGES	-0.08 (-0.94, 0.77)	2,005
100% JUICE	0.66* (0.07, 1.26)	753
MILK	-0.06 (-0.23, 0.10)	2,314
WATER	0.22 (-0.13, 0.57)	1,199
POWDERED SUGAR FREE	0.06 (-0.02, 0.15)	269
TEA, BOTTLED SUGAR FREE	0.69* (0.19, 1.19)	594
COFFEE, SF PREPARED	2.52* (0.04, 5.00)	195
SUGAR FREE SYRUP ADD ON	9.91 (-10.46, 30.28)	62
NON-TAXED SUGARY BEVERAGES:	0.17 (-0.19, 0.54)	1,420
CHOCOLATE MILK	-0.14 (-0.60, 0.31)	634
POWDERED SUGAR ADDED	0.12* (0.00, 0.25)	639
COFFEE, PREPARED (E.G., SWEETENED LATTES)	1.98 (-0.58, 4.54)	147
STORE TYPE:		
SUPERSTORES/SUPERMARKETS	0.20* (0.03, 0.37)	4,561
GROCERY/DRUG STORES	0.20 (-0.12, 0.53)	3,969
SMALL STORES	0.52* (0.20, 0.84)	4,718
WAREHOUSES	-0.05 (-0.77, 0.67)	75
COFFEE SHOPS	1.86+ (-0.43, 4.15)	269
QUICK SERVICE RESTAURANTS	1.75* (0.67, 2.82)	414

* $P \leq 0.05$

+ $P \leq 0.10$