WEB APPENDIX

CONSEQUENCES OF BOTTLE BILLS: HOW BOTTLE DEPOSIT RETURN SCHEMES AFFECT RETAIL PRICES AND LEAD CONSUMERS TO LARGER PACKAGE SIZES

Kristopher O. Keller (kristopher_keller@kenan-flagler.unc.edu)

Jonne Y. Guyt (j.y.guyt@uva.nl)

Table of Contents

Web Appendix A: Bottle Deposits Around the World	W2
Web Appendix B: Changes in Assortment	W4
Web Appendix C: Plastic Sold through Water Bottles	W8
Web Appendix D: Control Markets	W9
Web Appendix E: Detailed Parameter Estimates	W15
Web Appendix F: Calculation of Relative Sales Change	W17
Web Appendix G: In-Time Placebo Test	W18
Web Appendix H: Price and Sales Changes for Store and National Brands	W21
Web Appendix I: Detailed Parameter Estimates Robustness Checks	W22
Web Appendix J: Scenario Analysis on Retailer Costs	W33
Web Appendix K: Parameter Estimates Ideological Aversion	W38
Web Appendix L: Impact of Bottle Bill on Purchasing Patterns	W40
Web Appendix M: Additional Information Household-Level Analysis	W44
Web Appendix N: Parameter Estimates Additional Retailer Effort	W47
Web Appendix O: Estimates for Connecticut	W48

These materials have been supplied by the authors to aid in the understanding of their paper. The AMA is sharing these materials at the request of the authors.

Web Appendix A: Bottle Deposits Around the World

Table W1. Regions with Bottle Bills in Use

Region	Implementation	Deposit Amount	Most Recent Update (e.g., adoption, extension, increase in deposit)
United States			
Hawaii	2005	5¢	2013
California	1987	5¢-10¢[a]	2024
Connecticut	1980	5¢	2024
Iowa	1979	5¢	2023
Maine	1978	5¢-15¢[a]	2023
Massachusetts	1983	5¢	2010
Michigan	1978	10¢	2022
New York	1983	5¢	2009
Oregon	1972	10¢	2022
Vermont	1973	5¢-15¢[a]	2009
Canada			
Alberta	1972	CAD 10¢-25¢[a]	2009
British Columba	1970	CAD 5¢-20¢[a]	2022
Manitoba	2008	CAD 10¢-20¢[a]	2019
New Brunswick	1992	CAD 5¢-20¢[a]	2011
Newfoundland	1997	CAD 8¢-20¢[a]	2016
Nova Scotia	1996	CAD 5¢-20¢[a]	2019
Northwest Territories	2005	CAD 10¢-20¢[a]	2016
Ontario	2007	CAD 10¢-20¢[a]	
Prince Edward Island	2008	CAD 5¢-20¢[a]	
Quebec	1984	CAD 5¢-20¢[a]	2024
Sasketchewan	1973	CAD 5¢-40¢[a]	2017
Yukon Territory	1991	CAD 5¢-35¢[a]	2016
Australia			
Western Australia	2020	AUD .10	2025
Northern Territory	2013	AUD .10	2017
Queensland	2018	AUD .10	
New South Wales	2017	AUD .10	
Australian Capital Territory	2018	AUD .10	2025
South Australia	1977	AUD .10	
Tasmania	2023	AUD .10	
Victoria	2023	AUD .10	
Europe			
Austria	2025	.25 €	
Croatia	2005	.5 HRK	2020
Germany	2003	.25 €	2019
The Netherlands	2005	.15 €- .25€[a]	2023
Iceland	1989	16 ISK	
Denmark	1922	1-3 DKK	2020
Norway	1999	2-3 NOK	
Sweden	1984	1-2 SEK	2006
Finland	2006	.10 €-.40 €	2012
Estonia	2005	.10 €	
Latvia	2022	.10 €	
Lithuania	2016	.10 €	
Slovakia	2022	.15 €	
Malta	2022	.10 €	

Hungary	2024	50 HUF	
Republic of Ireland	2024	.15 € -.25 €	
Rest of the World			
Belize	2009		
Barbados	1986	5¢-15¢	2019
Republic of Seychelles	2007	1-2 SCR	
Israel	2001	.3 ILS	2010
Republic of Palau	2011	5¢-10¢	
Federated States of Micronesia	2003[b]	6¢	2012
Marshall Islands	2018		
Tuvalu	2019		
Kiribati	2005	AUD .05	
South Korea	2003	300 KRW	2022

[a] Depending on package size.
[b] Depends on islands (Yap introduced in 2003, followed by Kosae and Pohnpei in 2007 and 2012, respectively).
Notes: https://www.bottlebill.org/index.php/current-and-proposed-laws/usa/new-york, Global Deposit Book (2022).

Table W2. Proposed and Upcoming Bottle Bills

Proposed and Upcoming Programs[a]	Planned Deposit Amount	Planned Implementation
Belarus		TBA[c]
Belgium		2025
Bulgaria		2029
Cyprus		2025
Czech Republic		2025
France		2025
Greece		2025
Italy		2029
Luxembourg		2029
New Zealand		2025
Poland		2025
Portugal		2026
Romania	RON .50	2025
Scotland	GBP .20	2027
Singapore	.10 SGD	2025
Slovenia		2025
Spain		2026
Türkiye	TRY .50	2025
United Kingdom[b]		2025

[a] In 2023, the European Commission called for mandatory bottle bills for all of its member states (https://dwfgroup.com/en/news-and-insights/insights/2023/2/european-commission-calls-for-mandatory-deposit-and-return-systems-in-member-states). Additional information is taken from the Global Deposit Book (https://www.reloopplatform.org/global-deposit-book-2022/).
[b] Except Scotland.
[c] TBA = to be announced. The country committed to the introduction of a bottle bill but the implementation date is not yet known.

Web Appendix B: Changes in Assortment

In our main analysis, we focus on sales and price changes due to the bottle bill introduction and assess these changes for all consistently offered UPC–store pairs. Thus, we omit UPCs added or delisted due to the bottle bill. To assess the relevance of these UPCs, we shed light on two aspects: whether the number of UPCs offered in a store changes with a bottle bill introduction, and how relevant these added and/or delisted UPCs are in terms of overall sales.

Number of UPCs Offered

To check if the number of UPCs changed with the bottle bill introduction, we adjust our data in two ways. First, we assess *all* UPC–store pairs (rather than just those consistently offered in our analysis period). This results in additional UPCs. Second, we aggregate the data to the package size multipack–store–week (cf. UPC-store-week) level and calculate, for each package size-multipack pair, store, and week, the number of offered UPCs. We then estimate a set of SDID models with the number of UPCs as the dependent variable and the stores from the main analysis as control units. Table W3 presents the parameter estimates by package size-multipack (Table W4 presents the aggregate effect at the package size level). The number of UPCs changes significantly for all package sizes, except 16.9 fl. oz. ($\bar{\tau}_3$ = .014, p = .446) and 33.8 fl. oz. ($\bar{\tau}_6$ = -.025, p = .240), revealing some economically insignificant increases (8-11, 20 fl. oz.) and some decreases (23.7, >101.4 fl. oz.). For 20 fl. oz., for example, the average number of UPCs goes up by .329 ($\bar{\tau}_4$ = .329, p < .001), compared with a pre-bottle bill average number of UPCs per multipack of 8.528. Across all package size-multipack pairs, on average, .049 UPCs ($\frac{\sum_{i=1}^{48} \tau_i x N_i^T}{\sum_{i=1}^{48} N_i^T}$) are offered more, representing a 1.6% increase compared to the pre-treatment average assortment size of 3.06 UPCs per package size-multipack pair.

Table W3. Change in Number of UPCs Offered by Package Size

Package Size in fl. oz.	Multipack	Obs.	Est.	SE	p-value
8	1	23,712	.102	.024	<.001
8	6	20,280	-.022	.023	.324
8	8	28,704	.050	.016	.002
8	12	50,648	.017	.012	.176
8	24	21,008	.285	.024	<.001
8	32	728	<.001	.004	.997
8	48	13,832	-.027	.012	.030
11	4	8,216	-.030	.023	.191
11	8	84,448	.086	.009	<.001
11	24	1,768	-.043	.035	.214
11	36	3,536	.027	.031	.392
16.9	1	143,104	.243	.027	<.001
16.9	6	134,472	-.013	.025	.605
16.9	12	114,088	-.082	.016	<.001
16.9	15	22,152	-.077	.016	<.001
16.9	18	3,536	.012	.012	.328
16.9	20	39,624	-.302	.022	<.001
16.9	24	147,160	<.001	.012	.994
16.9	28	103,480	-.001	.007	.856
16.9	30	8,008	.068	.018	<.001
16.9	32	3,640	-.021	.032	.511
16.9	35	9,984	-.043	.018	.016
20	1	147,264	.819	.071	<.001
20	4	14,248	-.098	.053	.062
20	6	118,352	-.020	.006	.001
20	12	34,528	-.065	.019	.001
20	15	3,536	-.274	.095	.004
20	20	9,984	-.035	.019	.069
20	24	13,000	-.002	.003	.405
20	28	3,016	-.018	.010	.070
23.7	1	137,696	-.067	.009	<.001
23.7	6	27,976	-.011	.010	.291
23.7	12	15,288	-.035	.015	.020
23.7	20	936	-.008	.007	.232
23.7	24	11,128	-.008	.008	.300
23.7	28	2,496	<.001	<.001	.212
33.8	1	143,624	-.027	.022	.225
33.8	4	1,144	-.020	.020	.315
33.8	6	63,544	-.023	.016	.153
33.8	12	12,064	-.014	.037	.705
33.8	15	3,224	-.002	.007	.797
101.4	1	134,888	-.071	.009	<.001
101.4	6	832	-.031	.057	.587
128	1	146,328	-.030	.010	.003
128	3	9,048	-.065	.030	.033
128	6	8,944	-.009	.008	.268
320	1	108,160	-.039	.008	<.001
320	2	3,640	.020	.033	.544

Notes: Obs. is the number of observations from treated units.

Table W4. Change in Number of UPCs Offered by Package Size, Aggregated to Package Size

Package Size in fl. oz.	Obs.	Est.	SE	p-value
8	158,912	.062	.018	<.001
11	97,968	.072	.011	<.001
16.9	729,248	.014	.018	.446
20	343,928	.329	.038	<.001
23.7	195,520	-.052	.010	<.001
33.8	223,600	-.025	.021	.240
101.4	135,720	-.070	.009	<.001
128	164,320	-.031	.011	.005
320	111,800	-.037	.009	<.001

Notes: Estimates are the weighted average (both for the estimate and standard error) across multipack types, with the weight being the number of treated units.

Economic Importance of Added and Delisted UPCs

The average number of UPCs offered increases with the introduction of the bottle bill in New York, compared with control markets, which may be driven partially by replacements or updated UPCs to comply with the newly required deposit labeling on the product packaging. As the replacement UPCs enter the market, older UPCs may continue to be sold until their inventory is depleted, leading to a temporary increase in UPCs. To assess the relevance of UPCs not covered by our sample, we calculate two metrics: the total volume sales of UPCs in our focal sample and the total volume sales of UPCs in our focal sample plus all UPCs added or delisted in the post-introduction period. To determine the share of total volume sales of UPCs in our focal sample, we divide the former value by the latter. In the treated group, our sample covers about 88% of volume sales, indicating that omitting UPCs added after (and potentially because of) the bottle bill introduction is of limited economic importance. Moreover, this share is high in both treated markets (90.73%) and control markets (82.18%) and has increased from the pre- to the post-introduction period, as indicated in Table W5.

Table W5. Share of Total Volume Sales of UPC in Sample Among Treated and Control Markets, Before vs. After Bottle Bill Introduction

	Before	**After**
Treatment	85.37%	90.73%
Control	71.88%	82.18%

Web Appendix C: Plastic Sold through Water Bottles

We purchased water bottles in all package sizes offered by a popular brand, Deer Park, that offers all package sizes in our sample, and a 12 fl. oz. package size, though not 11 fl. oz. package size. We use the weight per fl. oz. (.808) to infer the 11 fl. oz. package weight. We weighed the empty containers and report these weights in Table W6.

Table W6. Weight of Water Bottles by Package Size

Package Size	Weight in Grams	Weight/fl. oz.
8 fl. oz.	7.4	.925
11 fl. oz.	8.9	.808
16.9 fl. oz.	9.7	.574
20 fl. oz.	15.2	.760
23.7 fl. oz.	19.8	.832
33.8 fl. oz.	20.7	.612
101.4 fl. oz.	81.9	.808
128 fl. oz.	65.2	.509
320 fl. oz.	178.0	.556

Most brands, including Deer Park, use polyethylene terephthalate (PET) for package sizes smaller than 128 fl. oz. and high-density polyethylene (HDPE) larger sizes. For the most popular package sizes in our data, 16.9 fl. oz. and 128 fl. oz, we purchased products from two other brands and weighed these containers as well. Their weights were the same as those of Deer Park's.

Web Appendix D: Control Markets

Table W7. Pre-treatment Correlation Treated and Control by Package Size

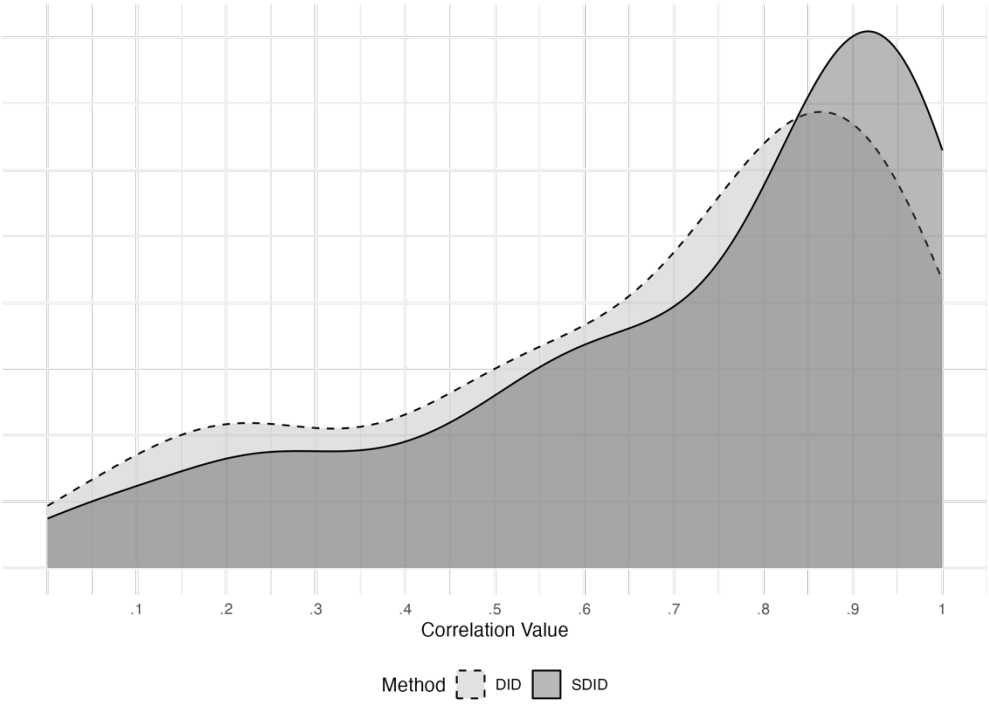
Package Size in fl. oz.	Multipack	UPC (ID)	Volume Sales Correlation Treated and Controls based on…		Price Correlation Treated and Control based on…	
			SDID	Raw Data	SDID	Raw Data[1]
8	8	1	.77	.71	.99	.98
	12	2	.57	.41	.96	.96
	12	3	.87	.87	>.99	>.99
	12	4	.27	.19	.96	.94
	24	5	.98	.98	>.99	>.99
11	8	6	.94	.89	.98	.96
16.9	1	7	.97	.97	.	.
	1	8	.94	.89	.98	.97
	1	9	.50	.50	.	.
	1	10	.68	.67	.91	.89
	1	11	.84	.71	.95	.93
	1	12	.95	.78	.63	.39
	1	13	.10	.10	.90	.90
	1	14	.90	.76	.98	.94
	1	15	.65	.53	.08	-.01
	1	16	.40	.37	-.04	-.08
	1	17	.86	.83	.66	.20
	6	18	.02	.00	.55	.40
	6	19	.41	.17	.98	-.54
	6	20	.23	.23	.95	.95
	6	21	.57	.56	.73	.70
	6	22	.41	.39	.73	.71
	6	23	.67	.67	.76	.74
	6	24	.58	.57	.79	.76
	6	25	.60	.59	.56	.45
	6	26	.65	.65	.75	.73
	6	27	.60	.59	.78	.74
	6	28	.93	.66	.94	.72
	6	29	.04	-.06	.34	.19
	6	30	.93	.92	.92	.83
	6	31	.74	.74	>.99	>.99
	6	32	.39	.39	.57	.45
	12	33	.89	.89	>.99	>.99
	12	34	.91	.91	>.99	>.99
	12	35	.08	.07	.	.
	12	36	.74	.72	>.99	>.99
	12	37	.59	.57	.	.
	12	38	.88	.88	.99	.99
	15	39	.99	.98	.98	.95
	24	40	.99	.25	.85	.58
	24	41	.75	.47	.74	.64
	24	42	.98	.97	.63	.24
	24	43	.90	.70	.95	.94
	24	44	.95	.94	.95	.93
	24	45	.98	.97	>.99	.99
	24	46	.88	.89	>.99	>.99
	24	47	>.99	.99	.99	.95
	24	48	.97	.97	.99	.99
	28	49	.87	.88	.67	.66
	30	50	.60	.57	.99	.98
20	1	51	.96	.88	.90	.49
	1	52	.97	.88	.93	.67
	1	53	.80	.79	.42	.41
	1	54	.71	.09	.18	.23
	1	55	.48	.48	>.99	>.99
	1	56	.20	.19	>.99	>.99

[1] In rare cases, there is no price variation in the pre-treatment period for either treated or (synthetic) control unit, implying a stable price the focal UPC or controls. In such cases, the correlation is not defined (though the SDID estimate is).

Package Size in fl. oz.	Multipack	UPC (ID)	Volume Sales Correlation Treated and Controls based on…		Price Correlation Treated and Control based on…	
			SDID	Raw Data	SDID	Raw Data[1]
	1	57	.23	.22	.99	.99
	1	58	.25	.24	>.99	>.99
	1	59	.99	.99	>.99	>.99
	4	60	.54	.51	.91	.90
	4	61	.51	.51	.86	.86
	4	62	.94	.93	.99	.99
	4	63	.97	.97	.99	.99
	4	64	.98	.97	.98	.98
	4	65	.96	.95	.99	.99
	6	66	.85	.82	.84	.62
	24	67	.97	.97	.99	.99
23.7	1	68	.95	.88	>.99	>.99
	6	69	.89	.83	.99	.97
	12	70	.91	.91	.99	.99
33.8	1	71	.94	.84	.96	.82
	1	72	.16	.16	.61	.61
	1	73	.97	.97	-.05	-.05
	1	74	.98	.77	.99	.98
	1	75	.85	.79	.64	.36
	1	76	.90	.87	.99	.95
	1	77	.66	.05	.88	.50
	1	78	.94	.75	.95	.49
	1	79	.86	.63	.97	.83
	1	80	.91	.82	.93	.79
	1	81	.91	.82	>.99	>.99
	6	82	.27	.24	.71	.70
	6	83	.25	.22	.98	.95
101.4	1	84	.97	.95	.99	.98
	1	85	.84	.83	.38	.37
128	1	86	.53	.53	.96	.96
	1	87	.22	.21	.97	.97
	1	88	.80	.79	.97	.97
	1	89	.91	.78	.92	.81
	1	90	.94	.94	-.04	-.04
	1	91	.73	.69	.60	.56
	1	92	.81	.81	>.99	>.99
	1	93	.42	.40	.98	.98
	1	94	.98	.93	>.99	.98
	1	95	.99	.97	>.99	.99
	1	96	.91	.85	.99	.64
	1	97	.95	.88	>.99	.97
	1	98	.81	.77	.87	.68
	1	99	.86	.85	.99	.99
	3	100	-.28	-.28	.	.
	3	101	-.18	-.19	.90	.90
	6	102	.73	.72	.62	-.49
320	1	103	.32	.32	.	.
	1	104	.87	.77	.69	.21
	1	105	.81	.79	>.99	.99
	1	106	.65	.53	>.99	>.99
	1	107	.60	.59	>.99	>.99
	1	108	.03	.02	.73	.73
	1	109	.62	.36	.96	.96
	2	110	.49	.48	.	.
	Average		.70	.64	.84	.75

Figure W1. Density Plot of Pre-Treatment Correlation across UPCs

Panel A: Volume Sales



Panel B: Price

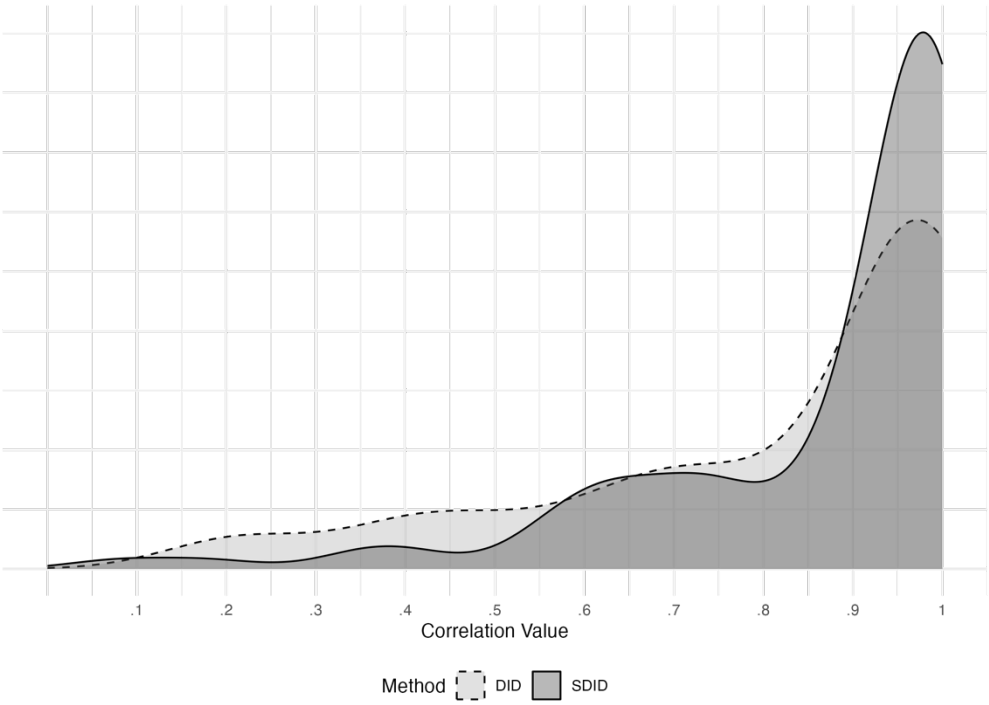
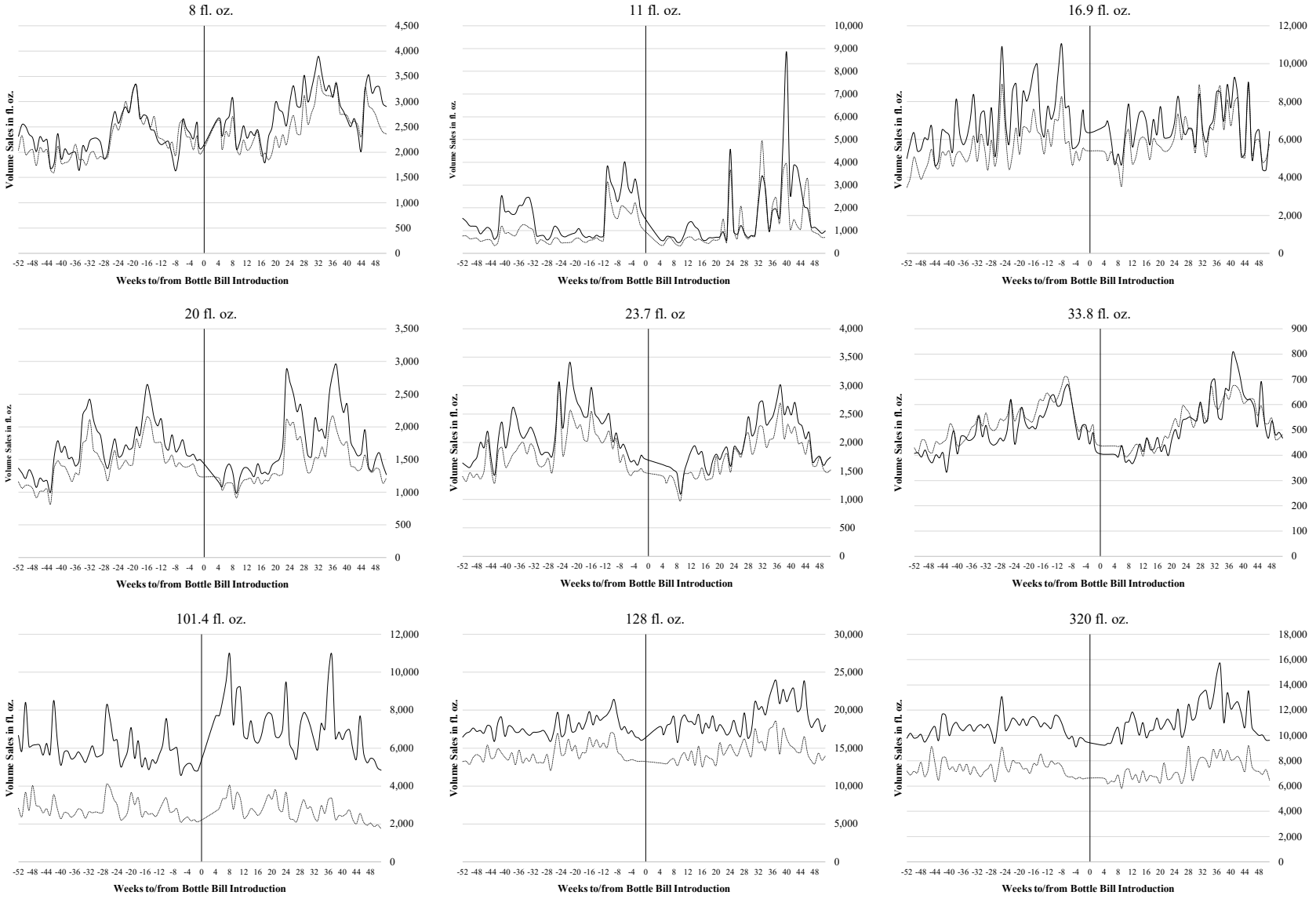
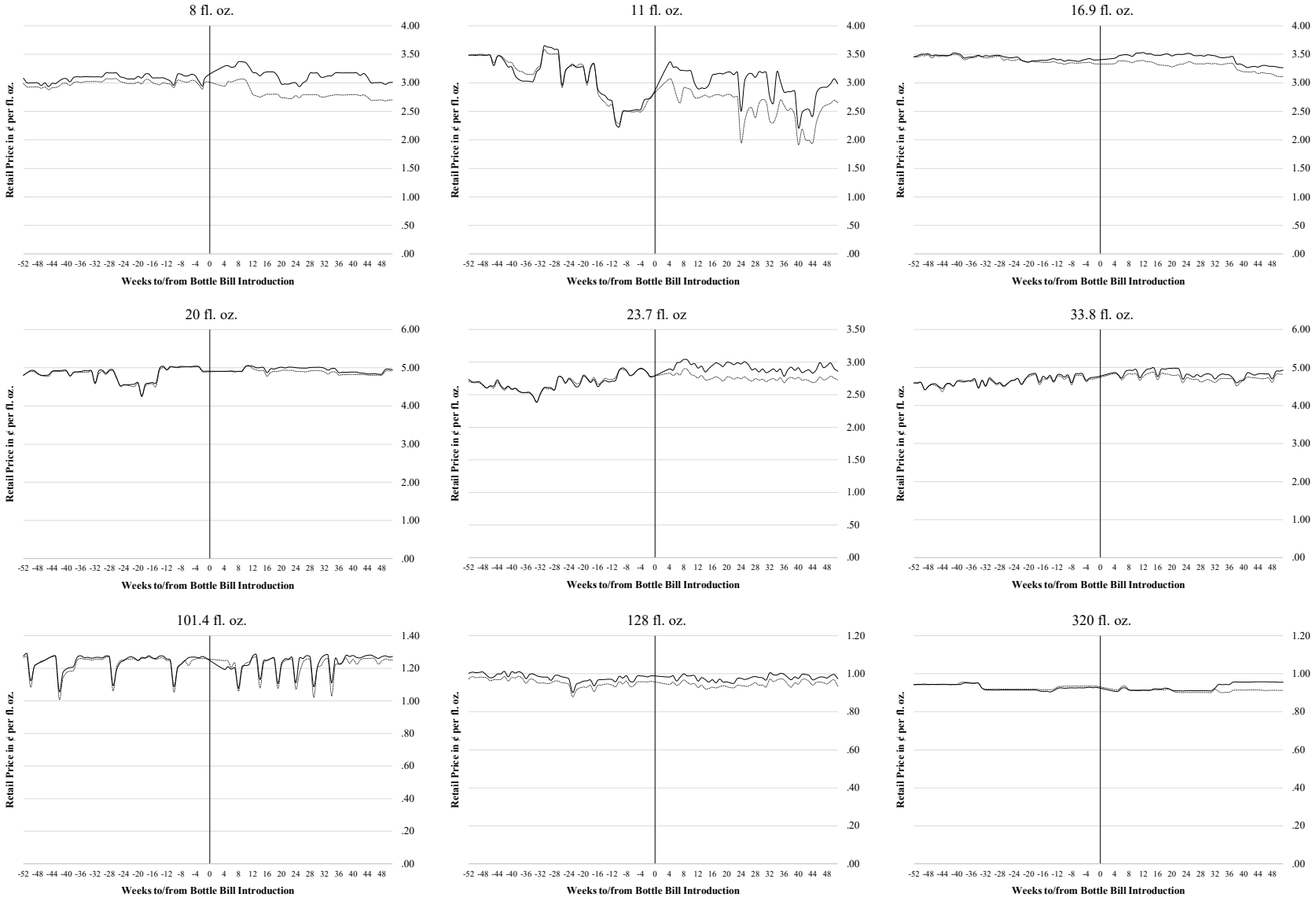


Figure W2. Volume Sales Evolution, Treated and Control Markets



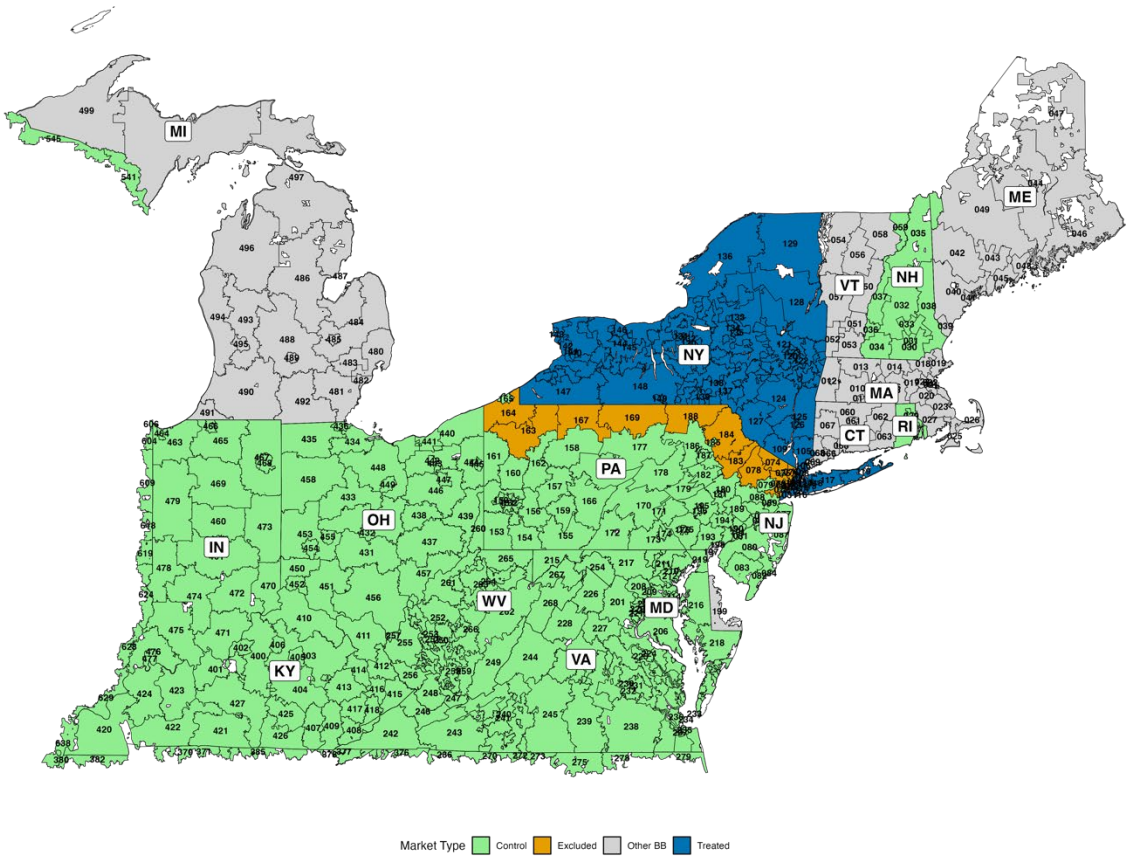
Notes: Black line represents average treated unit and the dotted line the average synthetic control unit. Averages are taken across UPCs within a package size.

Figure W3. Price Evolution, Treated and Control Markets



Notes: Black line represents average treated unit and the dotted line the average synthetic control unit. Averages are taken across UPCs within a package size.

Figure W4. Treated and Snapshot of Control Markets in the Northeast for the New York Bottle Bill



Notes: The blue area is the treated state, New York, the light green area is the set of markets (three-digit zip codes) eligible as control markets, the light grey markets are covered by a bottle bill, and the orange markets are neighboring the treated markets and not covered by a bottle bill. New York's bottle bill prohibits the return of bottles purchased in other states (even if they have New York deposit indications), imposing penalties of up to $100 per container or $25,000 total (see https://www.dec.ny.gov/chemical/57687.html).

Web Appendix E: Detailed Parameter Estimates

Table W8. Effect of Bottle Bills on Volume Sales and Retail Prices by UPC

Package Size in fl. oz.	Multipack	UPC (ID)	UPC-Store Pairs		Volume Sales			Price		
			Treated Cases	Control Cases	Est. ($\hat{\tau}_u^S$)	SE	p-value	Est. ($\hat{\tau}_u^P$)	SE	p-value
8	8	1	144	82	-38.64	26.88	.151	.746	.011	<.001
	12	2	145	88	-295.01	134.35	.028	.422	.035	<.001
		3	69	28	377.61	60.59	<.001	.006	.010	.560
		4	41	30	-248.00	60.29	<.001	.291	.028	<.001
	24	5	44	23	864.57	180.09	<.001	.005	.002	.005
11	8	6	244	195	-105.81	109.94	.336	.403	.031	<.001
16.9	1	7	34	58	-6.91	14.88	.642	.375	.021	<.001
		8	4	234	-742.56	508.87	.145	-.064	.064	.316
		9	13	16	-142.24	49.85	.004	<.001	<.001	.717
		10	43	30	10.25	6.09	.092	.005	.018	.786
		11	41	1,148	-13.35	20.60	.517	-.437	.064	<.001
		12	185	3,852	-18.65	11.49	.104	.514	.037	<.001
		13	29	3	17.08	9.73	.079	1.666	.278	<.001
		14	52	2,898	-7.00	6.55	.285	.130	.061	.033
		15	2	32	29.08	69.68	.676	.041	.066	.535
		16	1	9	-93.07	970.09	.924	-.017	.403	.966
		17	15	288	50.75	49.55	.306	.021	.066	.743
	6	18	16	50	-97.48	35.32	.006	.344	.020	<.001
		19	40	783	-70.13	28.70	.015	.498	.037	<.001
		20	1	4	469.93	309.30	.129	.285	.089	.002
		21	43	30	95.55	31.18	.002	.001	.001	.651
		22	41	29	83.99	27.95	.003	.002	.002	.204
		23	43	30	-25.51	44.73	.569	.003	.004	.512
		24	42	29	24.68	30.41	.417	<.001	.001	.915
		25	42	30	17.22	35.44	.627	-.003	.001	.001
		26	42	30	62.29	40.12	.121	-.002	.001	.063
		27	43	30	39.53	31.15	.204	-.002	.001	.052
		28	288	299	-242.19	52.54	<.001	.162	.015	<.001
		29	15	43	-51.30	29.25	.079	.624	.106	<.001
		30	198	1,065	-63.04	23.16	.006	.259	.020	<.001
		31	43	30	279.54	62.87	<.001	<.001	<.001	.579
		32	66	29	347.54	58.32	<.001	.007	.015	.638
	12	33	44	27	-58.25	39.52	.141	.002	.002	.209
		34	37	17	17.41	38.65	.652	<.001	.001	.825
		35	7	11	847.29	608.76	.164	<.001	<.001	.983
		36	97	43	71.17	89.40	.426	.359	.021	<.001
		37	40	28	829.49	117.62	<.001	<.001	<.001	.322
		38	67	32	377.77	56.31	<.001	.004	.007	.559
	15	39	77	3,579	183.39	73.71	.013	-.036	.008	<.001
	24	40	406	6,307	-4,159.43	576.44	<.001	.239	.007	<.001
		41	251	2,539	-3,026.10	325.47	<.001	.244	.007	<.001
		42	33	95	402.57	471.52	.393	.013	.011	.221
		43	205	932	-2,355.86	515.32	<.001	.059	.006	<.001
		44	272	173	-21,900.13	4,101.05	<.001	.130	.006	<.001
		45	429	1,426	509.02	74.71	<.001	.012	.001	<.001
		46	43	30	4,192.53	1,450.05	.004	.007	<.001	<.001
		47	133	4,787	-454.20	260.99	.082	.001	.004	.767
		48	101	50	14,136.37	3,309.47	<.001	.003	.003	.202
	28	49	1	3	-34,494.62	829.20	<.001	-.309	.087	<.001
	30	50	7	26	-11,451.03	2,265.33	<.001	.095	.032	.003
20	1	51	1,135	8,420	39.93	7.41	<.001	.285	.017	<.001
		52	1,021	10,290	30.81	6.35	<.001	.319	.010	<.001
		53	2	4	-139.32	382.44	.716	.012	.037	.744
		54	2	24	276.92	213.54	.195	-.158	.193	.415
		55	10	9	9.55	13.63	.484	<.001	<.001	.895
		56	7	5	15.37	11.84	.195	<.001	<.001	.961
		57	8	11	.08	13.35	.995	<.001	<.001	1.000
		58	11	11	4.30	12.17	.724	<.001	<.001	.539
		59	419	1,292	57.83	16.66	.001	.009	.004	.020
	4	60	1	17	67.31	93.40	.471	-.006	.013	.662
		61	1	13	-3.15	209.41	.988	.062	.080	.439
		62	14	283	-14.20	15.30	.353	-.240	.013	<.001
		63	26	434	-22.70	20.12	.259	-.001	.006	.845

Package Size in fl. oz.	Multipack	UPC (ID)	UPC-Store Pairs		Volume Sales			Price		
			Treated Cases	Control Cases	Est. ($\hat{\tau}_u^S$)	SE	p-value	Est. ($\hat{\tau}_u^P$)	SE	p-value
		64	18	409	-9.40	22.77	.680	.004	.006	.471
		65	10	169	-37.50	13.23	.005	.007	.008	.384
	6	66	101	693	-22.02	20.80	.290	.366	.044	<.001
	24	67	33	98	971.30	628.66	.122	.001	.008	.910
23.7	1	68	428	886	27.99	8.83	.002	.088	.014	<.001
	6	69	157	113	-107.61	72.80	.139	.224	.008	<.001
	12	70	134	72	-164.19	88.25	.063	.207	.005	<.001
33.8	1	71	476	4,392	19.91	10.19	.051	.202	.018	<.001
		72	10	2	34.91	13.80	.012	.253	.024	<.001
		73	70	76	48.63	18.43	.008	.079	.006	<.001
		74	618	7,278	28.58	16.34	.080	.129	.008	<.001
		75	4	224	-30.01	169.14	.859	.027	.014	.061
		76	156	197	72.34	34.72	.037	-.186	.042	<.001
		77	251	3,224	-25.26	28.89	.382	-.097	.034	.004
		78	311	4,441	-28.91	11.16	.010	.262	.018	<.001
		79	507	2,826	124.79	33.67	<.001	-.116	.016	<.001
		80	37	1,811	37.47	14.82	.011	-.047	.033	.145
		81	82	3,802	14.40	14.77	.330	-.015	.013	.243
	6	82	52	79	13.50	42.77	.752	.129	.022	<.001
		83	56	45	22.61	41.39	.585	.239	.020	<.001
101.4	1	84	646	816	775.21	139.05	<.001	.010	.002	<.001
		85	75	91	1,848.81	227.79	<.001	.004	.006	.535
128	1	86	29	7	-249.57	75.05	.001	-.049	.008	<.001
		87	27	16	1,003.61	753.25	.183	-.001	<.001	.074
		88	2	10	-1,320.90	2,382.24	.579	<.001	.036	.993
		89	274	5,694	11.52	53.66	.830	-.006	.003	.042
		90	70	76	72.99	59.10	.217	<.001	<.001	.946
		91	377	81	764.69	470.70	.104	.055	.005	<.001
		92	144	48	534.10	251.95	.034	.022	.003	<.001
		93	2	8	-65.31	717.20	.927	.022	.010	.027
		94	86	2,500	52.24	31.83	.101	<.001	.004	.923
		95	126	3,688	-134.81	61.11	.027	.008	.003	.018
		96	606	6,059	13.58	45.57	.766	-.009	.003	.001
		97	44	959	1,067.24	303.77	<.001	-.002	.001	.014
		98	103	51	2,797.62	485.00	<.001	-.005	.001	<.001
		99	66	142	98.44	36.12	.006	.004	.004	.281
	3	100	7	3	483.78	297.29	.104	<.001	<.001	<.001
		101	29	22	977.98	1,248.24	.433	.007	.004	.122
	6	102	34	18	8,335.42	4,702.08	.076	.010	.003	.006
320	1	103	18	4	-521.75	175.79	.003	.068	.004	<.001
		104	35	768	100.22	101.23	.322	.003	.002	.069
		105	331	353	1,052.34	119.15	<.001	<.001	.001	.863
		106	21	488	59.20	45.26	.191	.002	.004	.656
		107	36	28	815.02	221.93	<.001	<.001	<.001	.324
		108	20	13	-271.52	141.91	.056	.064	.004	<.001
		109	23	22	-124.02	269.41	.645	.046	.002	<.001
	2	110	34	18	3,531.51	1,700.63	.038	-.001	.001	.119

Notes: Jackknife-based standard errors are presented. Treated cases is the number of treated units. In case of one treated case, placebo-based standard errors are presented.

Table W9. Effect of Bottle Bills Aggregated to Package Size Level

Package Size in fl. oz.	# of UPCs	Treated Cases	Volume Sales			Price		
			Est.	SE	p-value	Est.	SE	p-value
8	5	443	12.61	85.61	.883	.409	.019	<.001
11	1	244	-105.81	109.94	.336	.403	.031	<.001
16.9	46	3,632	-1,978.82	581.10	.001	.144	.014	<.001
20	17	2,819	46.15	17.01	.007	.244	.013	<.001
23.7	3	719	-37.44	37.60	.319	.140	.011	<.001
33.8	13	2,630	35.94	21.51	.095	.065	.018	<.001
101.4	2	721	886.89	148.28	<.001	.010	.003	<.001
128	17	2,026	514.83	277.98	.064	.008	.003	.008
320	8	518	935.93	235.41	<.001	.007	.001	<.001

Notes: Estimates and standard errors are the weighted mean (using the number of treated cases as weight) across the UPC-level values, presented in Table W8. "# of UPCs" reflects the number of UPCs belonging to a package size.

Web Appendix F: Calculation of Relative Sales Change

Table W10. New York

	Package Size in fl. oz.									
	8	**11**	**16.9**	**20**	**23.7**	**33.8**	**101.4**	**128**	**320**	**Cumulative**
(1) Average Sales Before of Treated UPC-store pairs	2,650	1,554	13,303	675	1,431	526	5,218	9,154	8,615	
(2) Sales Change ($\hat{\tau}_i^s$)	12.61	-105.81	-1,978.82	46.15	-37.44	35.94	886.89	514.83	935.93	
(3) UPC-store pairs treated	443	244	3,632	2,819	719	2,630	721	2026	518	
Total Sales Before/Treat [(1) x (3)]	1,174,013	379,273	48,314,875	1,903,830	1,029,120	1,384,263	3,762,067	18,546,912	4,462,769	80,957,123
Total Sales Change [(2) x (3)]	5,587	-25,818	-7,187,058	130,090	-26,916	94,527	639,446	1,043,049	484,813	-4,842,279
Total Sales Change (Relative)	.5%	-6.8%	-14.9%	6.8%	-2.6%	6.8%	17.0%	5.6%	10.9%	-5.98%

Table W11. Connecticut

	Package Size in fl. oz.									
	8	**11**	**16.9**	**20**	**23.7**	**33.8**	**101.4**	**128**	**320**	**Cumulative**
(1) Average Sales Before of Treated UPC-store pairs	3,067	2,316	14,141	907	1,460	439	3,578	7,375	9,441	
(2) Sales Change ($\hat{\tau}_i^s$)	-17.03	-518.34	-2,632.11	65.64	2.69	-8.04	718.94	519.90	637.65	
(3) UPC-store pairs treated	163	54	1123	627	218	805	248	579	127	
Total Sales Before/Treat [(1) x (3)]	499,927	125,063	15,880,782	568,399	318,211	353,127	887,466	4,270,279	1,198,991	24,102,246
Total Sales Change [(2) x (3)]	-2,776	-27,990	-2,955,856	41,158	585	-6,473	178,297	301,021	80,982	-2,391,052
Total Sales Change (Relative)	-.6%	-22.4%	-18.6%	7.2%	.2%	-1.8%	20.1%	7.0%	6.8%	-9.92%

Web Appendix G: In-Time Placebo Test

In this in-time placebo test, we set the placebo treatment to be in the middle of the pre-treatment period (week 27). That is, we focus on the pre-treatment data only and use the first half of the pre-treatment period (weeks 1-26) as the "pre-placebo" period, and the second half of the pre-treatment period (weeks 27-52) as the "post-placebo" period. This falsification test allows us to assess whether our treatment effects are truly due to the bottle bill or whether they may be the result of something else, such as pre-existing trends. Specifically, we use, for each of the 110 UPCs, the treated and synthetic control series in the pre-treatment period and relate the outcome variable to a post indicator (1 if week $\geq$ 27, 0 else), a treatment indicator (1 for treated, 0 else), and their interaction effect. Table W12 provides detailed parameter estimates.[2]

[2] For volume sales, the significant UPCs are economically not very relevant at a combined market share of 1.91%. For price, four UPCs with statistically significant deviations are also of limited economic significance (their combined market share is 3.47%) and tend to make our results more conservative. We specify standard errors robust to serial correlation, but heteroskedasticity- and serial correlation robust standard errors result in virtually the same standard errors.

Table W12. Parameter Estimates In-Time Placebo and Main Analysis

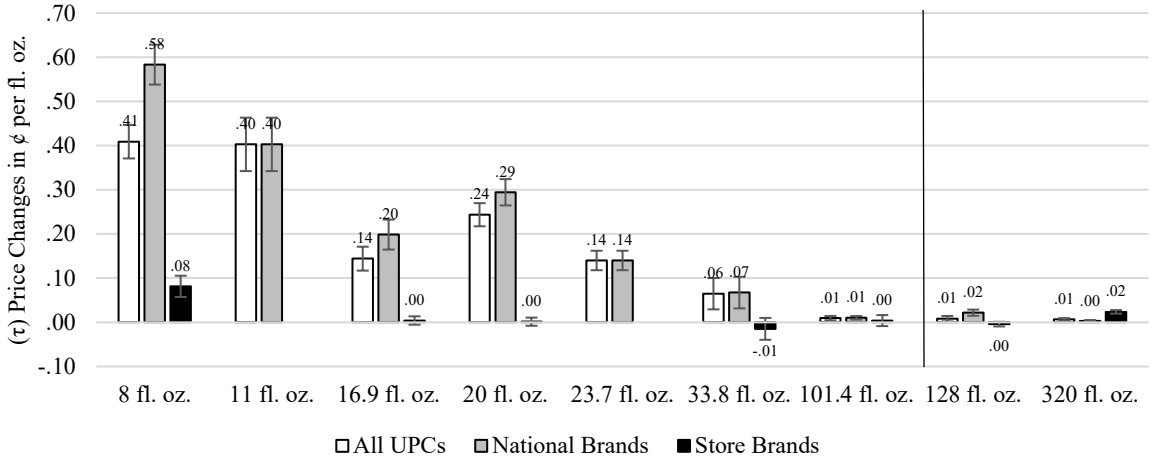
Package Size in fl. oz.	Multi -pack	UPC (ID)	Market Share in %	UPC-Store Pairs	Price						Volume Sales					
					In-time Placebo			Main Analysis			In-time Placebo			Main Analysis		
					Est.	SE	p-val.	Est.	SE	p-val.	Est.	SE	p-val.	Est.	SE	p-val.
8	8	1	.25	144	.049	.126	.697	.746	.011	<.001	-91.53	96.94	.347	-38.64	26.88	.151
	12	2	.88	145	.004	.057	.944	.422	.035	<.001	-236.70	414.24	.569	-295.01	134.35	.028
		3	.13	69	<.001	.031	.996	.006	.010	.560	-14.35	182.86	.938	377.61	60.59	<.001
		4	.07	41	.003	.027	.900	.291	.028	<.001	-300.43	126.96	.020	-248.00	60.29	<.001
	24	5	.13	44	-.003	.065	.960	.005	.002	.005	-200.51	723.76	.782	864.57	180.09	<.001
11	8	6	.47	244	-.023	.175	.897	.403	.031	<.001	26.14	548.10	.962	-105.81	109.94	.336
16.9	1	7	.01	34	<.001	<.001	.375	.375	.021	<.001	-41.32	45.87	.370	-6.91	14.88	.642
		8	.00	4	-.005	.054	.929	-.064	.064	.316	52.08	111.26	.641	-742.56	508.87	.145
		9	.01	13	-.022	.049	.653	<.001	<.001	.717	-58.26	26.26	.029	-142.24	49.85	.004
		10	.01	43	-.001	.018	.935	.005	.018	.786	1.95	11.73	.868	10.25	6.09	.092
		11	.01	41	.027	.069	.700	-.437	.064	<.001	17.44	29.08	.550	-13.35	20.60	.517
		12	.03	185	-.133	.078	.092	.514	.037	<.001	7.27	15.99	.651	-18.65	11.49	.105
		13	.00	29	-.311	.793	.696	1.666	.278	<.001	25.07	8.22	.003	17.08	9.73	.079
		14	.01	52	-.037	.200	.855	.130	.061	.033	-6.38	10.31	.538	-7.00	6.55	.285
		15	.00	2	-.041	.026	.119	.041	.066	.535	54.38	126.44	.668	29.08	69.68	.676
		16	.00	1	.075	.035	.037	-.017	.403	.966	-24.75	110.99	.824	-93.07	970.09	.924
		17	.01	15	-.006	.025	.805	.021	.066	.743	-9.36	47.51	.844	50.75	49.55	.306
	6	18	.01	16	-.038	.076	.619	.344	.020	<.001	-22.96	22.78	.316	-97.48	35.32	.006
		19	.02	40	-.017	.067	.802	.498	.037	<.001	-1.84	61.98	.976	-70.13	28.70	.015
		20	.00	1	-.625	.266	.021	.285	.089	.001	-8.65	143.36	.952	469.93	309.30	.129
		21	.04	43	-.003	.005	.539	.001	.001	.651	-14.43	50.54	.776	95.55	31.18	.002
		22	.03	41	-.001	.005	.766	.002	.002	.204	13.60	53.32	.799	83.99	27.95	.003
		23	.08	43	-.001	.004	.800	.003	.004	.512	16.90	75.32	.823	-25.51	44.73	.569
		24	.03	42	<.001	.005	.990	<.001	.001	.915	-5.44	44.04	.902	24.68	30.41	.417
		25	.05	42	-.003	.003	.403	-.003	.001	.001	-30.49	55.96	.587	17.22	35.44	.627
		26	.06	42	-.001	.003	.686	-.002	.001	.063	-58.98	64.62	.364	62.29	40.12	.121
		27	.05	43	-.002	.003	.487	-.002	.001	.052	-10.71	45.98	.816	39.53	31.15	.204
		28	.64	288	-.001	.073	.989	.162	.015	<.001	391.13	773.01	.614	-242.19	52.54	<.001
		29	.01	15	.025	.137	.857	.624	.106	<.001	44.93	28.32	.116	-51.30	29.25	.079
		30	.14	198	-.014	.127	.909	.259	.020	<.001	6.26	89.32	.944	-63.04	23.16	.006
		31	.06	43	<.001	.002	1.000	<.001	<.001	.579	-46.13	121.42	.705	279.54	62.87	<.001
		32	.06	66	-.001	.011	.924	.007	.015	.638	106.59	44.08	.017	347.54	58.32	<.001
	12	33	.04	44	<.001	.069	.999	.002	.002	.209	-34.15	145.00	.814	-58.25	39.52	.141
		34	.03	37	<.001	.071	1.000	<.001	.001	.825	-33.96	139.51	.808	17.41	38.65	.652
		35	.14	7	<.001	<.001	.299	<.001	<.001	.983	1,488.81	603.18	.015	847.29	608.76	.164
		36	.36	97	-.001	.084	.986	.359	.021	<.001	68.37	215.96	.752	71.17	89.40	.426
		37	.13	40	.001	.001	.357	<.001	<.001	.322	-215.94	220.89	.331	829.49	117.62	<.001
		38	.09	67	.002	.026	.948	.004	.007	.559	5.62	63.75	.930	377.77	56.31	<.001
	15	39	.30	77	.002	.106	.981	-.036	.008	<.001	-6.23	1,820.48	.997	183.39	73.71	.013
	24	40	7.80	406	-.014	.028	.615	.239	.007	<.001	394.90	5,104.01	.938	-4,159.43	576.44	<.001
		41	3.10	251	.008	.031	.801	.244	.007	<.001	-1,823.32	2,112.86	.390	-3,026.10	325.47	<.001
		42	.58	33	<.001	.003	.992	.013	.011	.221	-21.60	1,794.23	.990	402.57	471.52	.393
		43	2.23	205	-.022	.048	.646	.059	.006	<.001	513.07	2,610.40	.845	-2,355.86	515.32	<.001
		44	35.59	272	-.017	.041	.679	.130	.006	<.001	7,528.11	15,121.13	.620	-21,900.13	4,101.05	<.001
		45	1.29	429	.006	.063	.929	.012	.001	<.001	10.19	1,088.95	.993	509.02	74.71	<.001
		46	.82	43	<.001	.024	1.000	.007	<.001	<.001	-2,283.19	1,145.78	.049	4,192.53	1,450.05	.004
		47	1.86	133	.013	.045	.779	.001	.004	.767	-842.25	4,183.41	.841	-454.20	260.99	.082
		48	3.65	101	-.020	.045	.656	.003	.003	.202	-2,657.06	11,450.51	.817	14,136.37	3,309.47	<.001
	28	49	.02	1	-.059	.127	.645	-.309	.087	<.001	14,827.51	6,400.51	.023	-34,494.62	829.20	<.001
	30	50	.30	7	.004	.016	.801	.095	.032	.003	-1,383.56	3,998.97	.730	-11,451.03	2,265.33	<.001
20	1	51	.64	1135	.018	.055	.740	.285	.017	<.001	-3.04	49.92	.952	39.93	7.41	<.001
		52	.53	1021	-.003	.023	.897	.319	.010	<.001	-14.77	43.38	.734	30.81	6.35	<.001
		53	.00	2	-.026	.029	.383	.012	.037	.744	142.77	172.74	.410	-139.32	382.44	.716
		54	.00	2	-.035	.034	.308	-.158	.193	.415	55.26	77.81	.479	276.92	213.54	.195
		55	.00	10	.080	.282	.777	<.001	<.001	.895	2.75	10.76	.799	9.55	13.63	.484
		56	.00	7	-.176	.367	.633	<.001	<.001	.961	19.94	12.75	.121	15.37	11.84	.194
		57	.00	8	.101	.299	.736	<.001	<.001	1.000	32.92	10.65	.003	0.08	13.35	.995
		58	.00	11	.021	.339	.951	<.001	<.001	.539	0.66	8.28	.937	4.30	12.17	.724
		59	.11	419	.005	.333	.987	.009	.004	.020	0.56	131.68	.997	57.83	16.66	.001
	4	60	.00	1	.026	.104	.802	-.006	.013	.662	-100.87	68.59	.145	67.31	93.40	.471
		61	.00	1	.058	.103	.573	.062	.080	.439	-34.47	48.75	.481	-3.15	209.41	.988
		62	.00	14	.007	.109	.946	-.240	.013	<.001	-12.94	53.32	.809	-14.20	15.30	.353
		63	.01	26	.009	.106	.931	-.001	.006	.845	-17.84	61.85	.774	-22.70	20.12	.259
		64	.01	18	-.027	.098	.780	.004	.006	.471	-25.32	91.91	.784	-9.40	22.77	.680
		65	.00	10	.012	.109	.912	.007	.008	.384	3.44	55.39	.951	-37.50	13.23	.005
	6	66	.07	101	-.054	.140	.701	.366	.044	<.001	26.55	86.22	.759	-22.02	20.80	.290
	24	67	.98	33	.003	.056	.952	.001	.008	.910	20.59	3,497.26	.995	971.30	628.66	.122
23.7	1	68	.18	428	-.063	.026	.017	.088	.014	<.001	20.64	34.23	.548	27.99	8.83	.002
	6	69	.54	157	<.001	.094	.997	.224	.008	<.001	-35.21	587.22	.952	-107.61	72.80	.139
	12	70	.54	134	-.007	.072	.925	.207	.005	<.001	-12.94	323.49	.968	-164.19	88.25	.063
33.8	1	71	.18	476	-.015	.114	.893	.202	.018	<.001	-3.86	40.42	.924	19.91	10.19	.051
		72	.00	10	.006	.068	.930	.253	.024	<.001	31.51	13.76	.024	34.91	13.80	.011
		73	.04	70	<.001	<.001	.478	.079	.006	<.001	-40.56	81.67	.621	48.63	18.43	.008
		74	.22	618	.044	.158	.784	.129	.008	<.001	3.46	31.97	.914	28.58	16.34	.080
		75	.00	4	.015	.026	.572	.027	.014	.061	-33.22	95.69	.729	-30.01	169.14	.859
		76	.19	156	-.048	.043	.262	-.186	.042	<.001	63.92	44.26	.152	72.34	34.72	.037
		77	.08	251	-.001	.112	.990	-.097	.034	.004	30.11	16.17	.066	-25.26	28.89	.382
		78	.12	311	.016	.106	.879	.262	.018	<.001	2.70	39.54	.946	-28.91	11.16	.010

Package Size in fl. oz.	Multi -pack	UPC (ID)	Market Share in %	UPC-Store Pairs	Price						Volume Sales					
					In-time Placebo			Main Analysis			In-time Placebo			Main Analysis		
					Est.	SE	p-val.	Est.	SE	p-val.	Est.	SE	p-val.	Est.	SE	p-val.
		79	.74	507	.132	.179	.462	-.116	.016	<.001	-94.91	226.61	.676	124.79	33.67	<.001
		80	.01	37	.023	.041	.572	-.047	.033	.145	-0.90	28.07	.975	37.47	14.82	.011
		81	.04	82	.004	.278	.987	-.015	.013	.243	27.49	74.60	.713	14.40	14.77	.330
	6	82	.05	52	.006	.101	.956	.129	.022	<.001	-2.22	59.05	.970	13.50	42.77	.752
		83	.03	56	-.032	.053	.547	.239	.020	<.001	184.05	78.82	.022	22.61	41.39	.585
101.4	1	84	4.02	646	-.017	.055	.754	.010	.002	<.001	307.11	733.78	.676	775.21	139.05	<.001
		85	.63	75	.001	.004	.719	.004	.006	.535	-949.21	378.40	.014	1,848.81	227.79	<.001
128	1	86	.03	29	-.012	.040	.773	-.049	.008	<.001	131.00	104.92	.215	-249.57	75.05	.001
		87	.08	27	.004	.011	.700	-.001	<.001	.074	-1,003.30	338.26	.004	1,003.61	753.25	.183
		88	.03	2	<.001	.048	.994	<.001	.036	.993	-732.48	1,018.21	.474	-1,320.90	2,382.24	.579
		89	.60	274	-.005	.015	.754	-.006	.003	.042	47.56	88.58	.593	11.52	53.66	.830
		90	.12	70	<.001	<.001	.734	<.001	<.001	.946	-277.44	225.23	.221	72.99	59.10	.217
		91	5.89	377	.044	.045	.331	.055	.005	<.001	-2,086.28	1,368.26	.130	764.69	470.70	.104
		92	1.30	144	<.001	.033	1.000	.022	.003	<.001	139.95	210.27	.507	534.10	251.95	.034
		93	.00	2	.022	.053	.677	.022	.010	.027	372.50	312.04	.235	-65.31	717.20	.927
		94	.10	86	-.001	.073	.991	<.001	.004	.923	-7.26	188.28	.969	52.24	31.83	.101
		95	.44	126	.003	.035	.936	.008	.003	.018	45.00	373.28	.904	-134.81	61.11	.027
		96	1.42	606	.001	.023	.981	-.009	.003	.001	-61.27	122.01	.617	13.58	45.57	.766
		97	.18	44	.001	.009	.917	-.002	.001	.014	73.63	409.29	.858	1,067.24	303.77	<.001
		98	3.29	103	-.030	.007	<.001	-.005	.001	<.001	-493.78	1,180.83	.677	2,797.62	485.00	<.001
		99	.06	66	-.001	.035	.986	.004	.004	.281	51.35	98.55	.604	98.44	36.12	.006
	3	100	.02	7	-.002	.018	.929	<.001	<.001	<.001	-893.42	154.93	<.001	483.78	297.29	.104
		101	.66	29	<.001	.015	.987	.007	.004	.122	-435.47	902.18	.630	977.98	1,248.24	.433
	6	102	8.72	34	-.002	.004	.688	.010	.003	.006	2,636.55	6,662.86	.693	8,335.42	4,702.08	.076
320	1	103	.04	18	-.007	.072	.925	.068	.004	<.001	-379.78	151.79	.014	-521.75	175.79	.003
		104	.07	35	<.001	.001	.500	.003	.002	.069	-51.35	129.59	.693	100.22	101.23	.322
		105	2.35	331	<.001	.016	.996	<.001	.001	.863	40.95	207.97	.844	1,052.34	119.15	<.001
		106	.02	21	.001	.019	.973	.002	.004	.656	44.05	48.04	.361	59.20	45.26	.191
		107	.24	36	<.001	.030	.992	<.001	<.001	.324	-89.98	214.52	.676	815.02	221.93	<.001
		108	.04	20	-.004	.012	.714	.064	.004	<.001	-258.08	163.51	.118	-271.52	141.91	.056
		109	.19	23	<.001	.006	.940	.046	.002	<.001	-763.57	518.43	.144	-124.02	269.41	.645
	2	110	2.56	34	<.001	.205	1.000	-.001	.001	.119	4,112.14	2,108.33	.054	3,531.51	1,700.63	.038

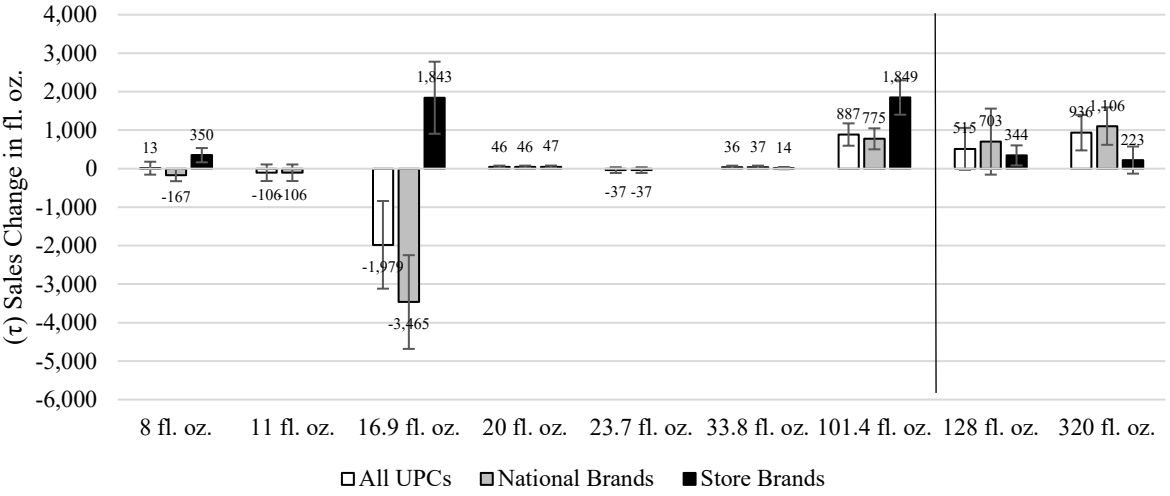
Web Appendix H: Price and Sales Changes for Store and National Brands

Figure W5. Price and Sales Changes by Package Size: Store and National Brands

Panel A: Price Changes



Panel B: Sales Changes



Notes: Bars show $\hat{\tau}_u^p$ (Panel A) and $\hat{\tau}_u^s$ (Panel B) along with 95% confidence intervals. The solid (dashed) vertical line represents the cut-off for covered package sizes. No store brand in our sample offered 11 fl. oz. or 23.7 fl. oz. package sizes.

Web Appendix I: Detailed Parameter Estimates Robustness Checks

Table W13. Overview Equations

Model		Equation
Focal Model	(1)	$(\hat{\tau}_u{}^p, \hat{\alpha}_{0u}{}^p, \hat{\alpha}_{us}{}^p, \hat{\gamma}_{ut}{}^p) = \underset{\tau_u^p, \alpha_{0u}^p, \alpha_{us}^p, \gamma_{ut}^p}{\arg\min} \left\{ \sum_{us\in N_u} \sum_{t=\ell_{u,-52}}^{\ell_{u,52}} \left(p_{ust} - \alpha_{0u}^p - \alpha_{us}^p - \gamma_{ut}^p - \text{bottlebill_post}_{ust} \cdot \tau_u^p\right)^2 \hat{\omega}_{us}{}^p \hat{\lambda}_{ut}{}^p \right\},$
	(2)	$(\hat{\tau}_u{}^s, \hat{\alpha}_{0u}{}^s, \hat{\alpha}_{us}{}^s, \hat{\gamma}_{tu}{}^s) = \underset{\tau_u^S, \alpha_{0u}^S, \alpha_{us}^S, \gamma_{ut}^S}{\arg\min} \left\{ \sum_{us\in N_u} \sum_{t=\ell_{u,-52}}^{\ell_{u,52}} \left(S_{ust} - \alpha_{0u}^S - \alpha_{us}^S - \gamma_{ut}^S - \text{bottlebill_post}_{ust} \cdot \tau_u^S\right)^2 \hat{\omega}_{us}{}^s \hat{\lambda}_{ut}{}^s \right\},$
Package Size-Multipack	(W1)	$(\hat{\tau}_i{}^p, \hat{\alpha}_{0i}{}^p, \hat{\alpha}_{usi}{}^p, \hat{\gamma}_{ti}{}^p) = \underset{\tau_i^p, \alpha_{0i}^p, \alpha_{usi}^p, \gamma_{ti}^p}{\arg\min} \left\{ \sum_{us\in N_i} \sum_{t=\ell_{i,-52}}^{\ell_{i,52}} \left(p_{usti} - \alpha_{0i}^p - \alpha_{usi}^p - \gamma_{ti}^p - \text{bottlebill_post}_{usti} \cdot \tau_i^p\right)^2 \hat{\omega}_{usi}{}^p \hat{\lambda}_{ti}{}^p \right\},$
	(W2)	$(\hat{\tau}_i{}^s, \hat{\alpha}_{0i}{}^s, \hat{\alpha}_{usi}{}^s, \hat{\gamma}_{ti}{}^s) = \underset{\tau_i^S, \alpha_{0i}^S, \alpha_{usi}^S, \gamma_{ti}^S}{\arg\min} \left\{ \sum_{us\in N_i} \sum_{t=\ell_{i,-52}}^{\ell_{i,52}} \left(S_{usti} - \alpha_{0i}^S - \alpha_{usi}^S - \gamma_{ti}^S - \text{bottlebill_post}_{usti} \cdot \tau_i^S\right)^2 \hat{\omega}_{usi}{}^s \hat{\lambda}_{ti}{}^s \right\},$
Package Size	(W3)	$(\hat{\tau}_j{}^p, \hat{\alpha}_{0j}{}^p, \hat{\alpha}_{usj}{}^p, \hat{\gamma}_{tj}{}^p) = \underset{\tau_j^p, \alpha_{0j}^p, \alpha_{usj}^p, \gamma_{tj}^p}{\arg\min} \left\{ \sum_{us\in N_j} \sum_{t=\ell_{j,-52}}^{\ell_{j,52}} \left(p_{ustj} - \alpha_{0j}^p - \alpha_{usj}^p - \gamma_{tj}^p - \text{bottlebill_post}_{ustj} \cdot \tau_j^p\right)^2 \hat{\omega}_{usj}{}^p \hat{\lambda}_{tj}{}^p \right\},$
	(W4)	$(\hat{\tau}_j{}^s, \hat{\alpha}_{0j}{}^s, \hat{\alpha}_{usj}{}^s, \hat{\gamma}_{tj}{}^s) = \underset{\tau_j^S, \alpha_{0j}^S, \alpha_{usj}^S, \gamma_{tj}^S}{\arg\min} \left\{ \sum_{us\in N_j} \sum_{t=\ell_{j,-52}}^{\ell_{j,52}} \left(S_{ustj} - \alpha_{0j}^S - \alpha_{usj}^S - \gamma_{tj}^S - \text{bottlebill_post}_{ustj} \cdot \tau_j^S\right)^2 \hat{\omega}_{usj}{}^s \hat{\lambda}_{tj}{}^s \right\},$
DID	(W5)	$p_{ust} = \alpha_{us}^p + \gamma_{tu}^p + \text{bottlebill_post}_{ust} \cdot \tau_u^p + \varepsilon_{ust}^p$
	(W6)	$S_{ust} = \alpha_{us}^S + \gamma_{tu}^S + \text{bottlebill_post}_{ust} \cdot \tau_u^S + \varepsilon_{ust}^S$

Notes: p_{ust} (S_{ust}) represents the absolute price in ¢ per fl. oz. (volume sales in fl. oz.) of UPC u in store s in week t, $\hat{\tau}_u{}^p$ captures the effect of the implementation of the bottle bill on the price of UPCs; α_{0u}^p is an intercept; α_{us}^p and γ_{ut}^p are UPC-store and UPC-week fixed effects, respectively; N_u is the set of eligible UPC-store pairs in both the treated and control states for a given UPC for which we observe a balanced panel; $\ell_{u,-52}$ denotes the start of the analysis window for UPC u, whereas $\ell_{u,52}$ is the end; $\text{bottlebill_post}_{ust}$ is an indicator that equals 1 in the period after the bottle bill was implemented (for stores in New York); $\hat{\omega}_{us}{}^p$ and $\hat{\lambda}_{ut}{}^p$ are unit weights for the control UPC-store pairs and time weights. i reflects a package size-multipack pair (e.g., single pack of 16.9 fl. oz., 24-pack of 16.9 fl. oz.), while j is a package size (e.g., 16.9 fl. oz.). ε_{ust}^p is an error term.

Table W14. Estimation at the Package Size-Multipack Level: Effect of Bottle Bills on Volume Sales and Retail Prices by Package Size-Multipack

Package Size in fl. oz.	Multipack	Treated Cases	Volume Sales (Equation W2) Est.	SE	p-val.	Price (Equation W1) Est.	SE	p-val.
8	8	144	-38.63	26.88	.151	.746	.011	<.001
	12	255	-84.77	83.03	.307	.272	.023	<.001
	24	44	864.68	180.07	<.001	.005	.002	.005
11	8	244	-105.31	110.07	.339	.403	.031	<.001
16.9	1	419	-19.23	9.47	.042	.248	.025	<.001
	6	963	-41.66	15.20	.006	.120	.007	<.001
	12	292	205.67	47.95	<.001	.099	.011	<.001
	15	77	191.38	73.95	.010	-.036	.008	<.001
	24	1,873	-1,985.60	489.58	<.001	.112	.003	<.001
	28	1	-34,494.24	829.20	<.001	-.328	.017	<.001
	30	7	-11,493.93	2,269.56	<.001	.095	.032	.003
20	1	2,615	36.93	4.97	<.001	.244	.009	<.001
	4	70	-18.32	9.55	.055	-.044	.012	<.001
	6	101	-22.00	20.81	.290	.364	.045	<.001
	24	33	971.75	628.75	.122	.001	.008	.928
23.7	1	428	27.97	8.84	.002	.088	.014	<.001
	6	157	-107.60	72.81	.139	.224	.008	<.001
	12	134	-164.23	88.25	.063	.207	.005	<.001
33.8	1	2,522	35.85	10.01	<.001	.097	.008	<.001
	6	108	26.64	32.25	.409	.177	.016	<.001
101.4	1	721	929.37	126.56	<.001	.009	.002	<.001
128	1	1,956	109.09	83.30	.190	-.003	.002	.068
	3	36	496.94	956.91	.604	.005	.003	.132
	6	34	8,335.70	4,702.09	.076	.010	.003	.006
320	1	484	472.61	79.73	<.001	.004	.001	<.001
	2	34	3,531.27	1,700.69	.038	-.001	.001	.119

Notes: Jackknife-based standard errors are presented. Treated cases is the number of treated units. In case of one treated case, placebo-based standard errors are presented.

Table W15. Estimation at the Package Size Level: Effect of Bottle Bills on Volume Sales and Retail Prices by Package Size

Package Size in fl. oz.	Treated Cases	Volume Sales (Equation W4) Est.	SE	p-value	Price (Equation W3) Est.	SE	p-value
8	443	46.87	56.63	.408	.395	.019	<.001
11	244	-105.31	110.07	.339	.403	.031	<.001
16.9	3,632	-1,018.26	254.67	<.001	.110	.005	<.001
20	2,819	42.92	8.17	<.001	.246	.009	<.001
23.7	719	-11.64	20.73	.574	.116	.010	<.001
33.8	2,630	38.11	9.65	<.001	.095	.008	<.001
101.4	721	929.37	126.56	<.001	.009	.002	<.001
128	2,026	205.35	125.65	.102	-.003	.002	.088
320	518	540.13	133.94	<.001	.004	.001	<.001

Notes: Jackknife-based standard errors are presented. Treated cases is the number of treated units.

Table W16. Weeks 5–26: Effect of Bottle Bills on Volume Sales and Retail Prices by UPC

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales			Price		
				Est. ($\hat{\tau}_{u}^{S}$)	SE	p-val.	Est. ($\hat{\tau}_{u}^{P}$)	SE	p-val.
8	8	1	107	10.54	26.52	.691	.680	.015	<.001
	12	2	107	51.88	123.85	.675	.407	.036	<.001
		3	51	204.67	67.86	.003	.024	.014	.093
		4	30	-126.07	47.46	.008	.244	.019	<.001
	24	5	33	822.72	169.40	<.001	.011	.003	<.001
11	8	6	181	-91.71	53.53	.087	.363	.033	<.001
16.9	1	7	25	-4.28	10.28	.677	.592	<.001	<.001
		8	3	-309.22	375.35	.410	-.051	.066	.446
		9	10	-132.84	43.64	.002	<.001	<.001	.740
		10	32	2.23	5.76	.698	.014	.013	.269
		11	30	-25.47	16.63	.126	-.051	.060	.389
		12	137	-8.24	5.73	.151	.403	.036	<.001
		13	21	18.62	9.83	.058	1.465	.317	<.001
		14	38	5.47	5.71	.338	.030	.056	.594
		15	1	72.47	47.61	.128	.023	.026	.389
		16	1	-298.13	1,027.37	.772	.018	.166	.914
		17	11	15.61	33.65	.643	-.036	.123	.772
	6	18	12	-94.84	33.71	.005	.324	.021	<.001
		19	30	-27.54	28.49	.334	.439	.034	<.001
		20	1	552.80	130.28	<.001	.537	.024	<.001
		21	32	60.66	30.94	.050	<.001	<.001	.598
		22	30	41.50	33.53	.216	.005	.003	.100
		23	32	-45.47	35.00	.194	.003	.002	.138
		24	31	-6.95	30.31	.819	.008	.006	.136
		25	31	-18.18	30.24	.548	-.001	.001	.320
		26	31	8.50	33.22	.798	<.001	.002	.837
		27	32	43.21	26.71	.106	<.001	<.001	.320
		28	213	-16.58	37.57	.659	.157	.016	<.001
		29	11	-91.38	33.22	.006	.725	.123	<.001
		30	147	-51.27	24.66	.038	.190	.012	<.001
		31	32	345.89	62.24	<.001	<.001	<.001	.919
		32	49	376.56	66.44	<.001	-.001	.015	.926
	12	33	33	-35.33	41.05	.389	-.002	.002	.319
		34	27	77.21	39.65	.052	.001	.001	.555
		35	5	1,313.40	423.69	.002	<.001	<.001	.341
		36	72	298.42	105.38	.005	.301	.016	<.001
		37	30	603.47	104.29	<.001	<.001	<.001	.865
		38	50	421.52	45.59	<.001	-.003	.004	.401
	15	39	57	164.56	72.62	.023	-.011	.010	.273
	24	40	300	-1,486.40	355.48	<.001	.222	.008	<.001
		41	186	-976.46	405.01	.016	.209	.009	<.001
		42	24	355.07	379.63	.350	<.001	.010	.983
		43	152	-2,629.93	504.04	<.001	.075	.008	<.001
		44	201	-18,132.01	2,460.29	<.001	.159	.009	<.001
		45	317	508.07	89.53	<.001	.019	.002	<.001
		46	32	6,114.47	1,374.78	<.001	<.001	<.001	.987
		47	98	-318.76	264.01	.227	.012	.003	<.001
		48	75	15,115.63	2,273.50	<.001	.007	.003	.009
	28	49	1	-36,803.05	1,385.19	<.001	-.405	.054	<.001
	30	50	5	2,116.40	5,592.27	.705	.075	.013	<.001
20	1	51	840	21.95	6.25	<.001	.278	.015	<.001
		52	756	31.02	5.56	<.001	.358	.010	<.001
		53	1	-215.44	398.35	.589	.028	.037	.451
		54	1	324.27	287.34	.259	-.090	.243	.711
		55	7	3.22	11.61	.782	<.001	<.001	.674
		56	5	14.79	11.43	.196	<.001	<.001	.790
		57	6	-10.28	13.68	.453	<.001	<.001	1.000
		58	8	10.30	12.47	.409	<.001	<.001	.266
		59	310	24.15	15.82	.127	.006	.006	.257
	4	60	1	-30.19	84.51	.721	-.016	.040	.686
		61	1	-7.29	204.94	.972	.067	.083	.415
		62	10	-8.26	19.06	.665	-.539	.018	<.001
		63	19	-20.66	23.31	.375	.008	.007	.232
		64	13	-26.78	24.60	.276	.005	.007	.538
		65	7	-33.57	14.31	.019	.009	.010	.339
	6	66	75	-21.70	15.80	.170	.446	.048	<.001

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales			Price		
				Est. ($\hat{\tau}_u^S$)	SE	p-val.	Est. ($\hat{\tau}_u^P$)	SE	p-val.
	24	67	24	-22.58	564.12	.968	-.002	.009	.853
23.7	1	68	317	22.05	8.61	.010	.066	.013	<.001
	6	69	116	-187.09	52.89	<.001	.266	.008	<.001
	12	70	99	-150.31	80.12	.061	.215	.005	<.001
33.8	1	71	352	9.86	8.70	.257	.189	.019	<.001
		72	7	4.35	14.16	.759	.248	.035	<.001
		73	52	7.28	13.46	.589	.296	<.001	<.001
		74	457	13.61	10.90	.212	.139	.010	<.001
		75	3	-32.02	132.25	.809	.010	.014	.462
		76	115	18.17	28.32	.521	-.138	.041	.001
		77	186	-18.61	23.27	.424	-.060	.033	.065
		78	230	-4.54	11.42	.691	.171	.015	<.001
		79	375	109.92	33.97	.001	-.143	.019	<.001
		80	27	23.88	10.87	.028	-.104	.050	.037
		81	61	2.00	15.35	.896	-.044	.019	.020
	6	82	38	-54.66	33.61	.104	.144	.019	<.001
		83	41	11.79	38.75	.761	.194	.017	<.001
101.4	1	84	478	943.64	192.24	<.001	.009	.003	.002
		85	56	1,806.45	232.43	<.001	-.014	.007	.037
128	1	86	21	-345.68	77.47	<.001	-.027	.011	.012
		87	20	518.56	426.70	.224	-.002	.001	.085
		88	1	-1,711.11	709.54	.016	.017	.057	.766
		89	203	-32.25	57.00	.572	-.013	.003	<.001
		90	52	87.99	47.95	.067	<.001	<.001	.909
		91	279	962.16	381.11	.012	.027	.004	<.001
		92	107	590.42	262.63	.025	.023	.003	<.001
		93	1	-546.43	122.20	<.001	.022	.021	.303
		94	64	14.05	34.72	.686	-.007	.007	.300
		95	93	48.28	50.92	.343	.005	.004	.160
		96	448	69.64	44.45	.117	-.013	.003	<.001
		97	33	721.96	330.90	.029	-.002	.001	.014
		98	76	2,007.84	468.15	<.001	-.004	.001	<.001
		99	49	177.35	46.62	<.001	.004	.004	.369
	3	100	5	487.42	169.28	.004	<.001	<.001	.209
		101	21	2,138.35	1,162.25	.066	.029	.001	<.001
	6	102	25	7,387.77	3,256.31	.023	.007	.002	.001
320	1	103	13	-532.81	166.45	.001	.043	.003	<.001
		104	26	135.61	129.39	.295	.002	.001	.019
		105	245	856.38	109.92	<.001	-.001	.001	.124
		106	16	69.83	48.98	.154	-.004	.006	.446
		107	27	920.97	233.60	<.001	<.001	<.001	.507
		108	15	-123.58	165.78	.456	<.001	.003	.889
		109	17	-429.66	330.75	.194	-.011	.002	<.001
	2	110	25	4,049.01	1,920.30	.035	-.004	.001	.003

Notes: Jackknife-based standard errors are presented. Treated cases is the number of treated units. In case of one treated case, placebo-based standard errors are presented.

Table W17. Weeks 5–26: Effect of Bottle Bills Aggregated to Package Size Level

Package Size in fl. oz.	# of UPCs	Treated Cases	Volume Sales			Price		
			Est.	SE	p-value	Est.	SE	p-value
8	5	443	122.33	80.94	.131	.382	.021	<.001
11	1	244	-91.71	53.53	.087	.363	.033	<.001
16.9	46	3,632	-1,167.41	414.12	.005	.136	.014	<.001
20	17	2,819	22.22	15.32	.147	.256	.013	<.001
23.7	3	719	-55.74	31.61	.078	.137	.011	<.001
33.8	13	2,630	24.67	18.67	.186	.059	.019	.002
101.4	2	721	1,033.40	196.42	<.001	.006	.003	.052
128	17	2,026	523.65	228.88	.022	.001	.003	.749
320	8	518	846.63	250.11	.001	<.001	.001	.878

Notes: Estimates and standard errors are the weighted mean (using the number of treated cases as weight) across the UPC-level values, presented in Table W16. "# of UPCs" reflects the number of UPCs belonging to a package size.

Table W18. Weeks 27–52: Effect of Bottle Bills on Volume Sales and Retail Prices by UPC

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales			Price		
				Est. ($\hat{\tau}_{u}^{S}$)	SE	p-val.	Est. ($\hat{\tau}_{u}^{P}$)	SE	p-val.
8	8	1	112	-78.90	32.95	.017	.776	.018	<.001
	12	2	113	-611.84	178.52	.001	.432	.038	<.001
		3	54	532.48	70.81	<.001	-.009	.014	.535
		4	32	-319.60	86.16	<.001	.340	.037	<.001
	24	5	34	959.73	259.72	<.001	<.001	.001	.834
11	8	6	190	-244.41	185.80	.188	.441	.031	<.001
16.9	1	7	27	-17.28	24.27	.476	.193	.040	<.001
		8	3	-1,097.91	670.50	.102	-.084	.100	.401
		9	10	-142.49	59.62	.017	<.001	<.001	.717
		10	34	17.95	7.75	.021	-.007	.019	.719
		11	32	-5.25	30.38	.863	-.774	.107	<.001
		12	144	-26.60	18.31	.146	.587	.044	<.001
		13	23	15.77	10.47	.132	1.836	.268	<.001
		14	41	-17.71	7.93	.026	.203	.073	.005
		15	2	-53.93	26.65	.043	.033	.063	.602
		16	1	81.00	486.95	.868	-.284	.876	.746
		17	12	73.59	66.73	.270	.067	.043	.118
	6	18	12	-85.45	37.79	.024	.356	.019	<.001
		19	31	-86.86	31.18	.005	.548	.040	<.001
		20	1	466.87	589.98	.429	.080	.140	.569
		21	34	118.68	44.65	.008	<.001	.002	.998
		22	32	91.23	34.49	.008	.001	.002	.490
		23	34	-5.53	64.12	.931	-.001	.001	.305
		24	33	63.03	37.12	.090	-.001	.002	.485
		25	33	41.03	49.33	.406	-.005	.002	.001
		26	33	103.54	55.25	.061	-.004	.002	.017
		27	34	50.34	42.32	.234	-.004	.002	.062
		28	225	-438.49	87.94	<.001	.166	.015	<.001
		29	12	-15.05	30.08	.617	.534	.096	<.001
		30	154	-69.69	26.29	.008	.310	.029	<.001
		31	34	191.63	84.91	.024	<.001	<.001	.319
		32	51	375.22	70.08	<.001	.015	.015	.323
	12	33	34	-73.32	47.00	.119	.005	.003	.058
		34	29	-38.39	41.03	.349	.001	.003	.841
		35	5	381.25	979.65	.697	<.001	<.001	.721
		36	76	-184.88	106.71	.083	.408	.026	<.001
		37	31	1,020.22	167.65	<.001	<.001	<.001	.323
		38	52	329.59	85.98	<.001	.010	.013	.428
	15	39	60	239.87	91.98	.009	-.057	.010	<.001
	24	40	317	-6,299.86	848.49	<.001	.254	.008	<.001
		41	196	-4,838.03	492.15	<.001	.273	.007	<.001
		42	26	493.94	636.51	.438	.024	.013	.071
		43	160	-2,233.29	587.82	<.001	.046	.005	<.001
		44	212	-17,018.65	5,642.49	.003	.102	.006	<.001
		45	335	505.50	88.06	<.001	.006	.001	<.001
		46	34	2,655.84	1,861.84	.154	.012	<.001	<.001
		47	104	-554.46	286.38	.053	-.007	.006	.288
		48	79	7,707.33	5,183.67	.137	.007	.005	.140
	28	49	1	-32,541.34	407.87	<.001	-.154	.017	<.001
	30	50	5	-24,047.43	4,167.57	<.001	.111	.049	.023
20	1	51	885	54.66	9.60	<.001	.286	.020	<.001
		52	796	30.79	8.86	.001	.284	.012	<.001
		53	2	-5.43	392.58	.989	-.007	.051	.891
		54	2	235.71	161.90	.146	-.211	.158	.182
		55	8	9.12	17.34	.599	<.001	<.001	.901
		56	5	7.45	17.49	.670	<.001	<.001	.937
		57	6	15.97	16.06	.320	<.001	<.001	1.000
		58	9	-1.39	14.95	.926	<.001	<.001	.356
		59	327	88.11	22.42	<.001	.012	.004	.003
	4	60	1	67.36	112.10	.548	.004	.003	.218
		61	1	27.04	219.62	.902	.023	.068	.741
		62	11	-18.91	15.76	.230	.013	.010	.200
		63	20	-26.89	21.51	.211	-.008	.007	.286
		64	14	8.48	26.87	.752	.004	.007	.519
		65	8	-40.29	17.32	.020	.006	.008	.421
	6	66	79	-26.19	29.67	.377	.298	.046	<.001

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales			Price		
				Est. ($\hat{\tau}_u^S$)	SE	p-val.	Est. ($\hat{\tau}_u^P$)	SE	p-val.
	24	67	26	1,604.61	719.92	.026	.002	.009	.813
23.7	1	68	334	26.05	12.42	.036	.109	.017	<.001
	6	69	122	-40.54	110.35	.713	.187	.011	<.001
	12	70	105	-176.94	114.07	.121	.200	.007	<.001
33.8	1	71	371	26.55	13.97	.057	.210	.018	<.001
		72	8	60.76	17.35	<.001	.258	.038	<.001
		73	55	97.04	27.48	<.001	-.104	.011	<.001
		74	482	40.49	25.85	.117	.122	.009	<.001
		75	3	-27.60	212.63	.897	.040	.026	.121
		76	122	118.02	45.65	.010	-.234	.051	<.001
		77	196	-17.31	34.13	.612	-.114	.041	.005
		78	243	-51.22	14.65	<.001	.342	.023	<.001
		79	395	132.67	48.30	.006	-.098	.017	<.001
		80	29	47.28	21.63	.029	-.003	.027	.925
		81	64	29.80	17.66	.092	.008	.011	.477
	6	82	41	61.02	63.22	.334	.109	.028	<.001
		83	44	50.16	51.37	.329	.273	.027	<.001
101.4	1	84	504	690.49	133.59	<.001	.012	.002	<.001
		85	59	1,887.38	279.65	<.001	.014	.007	.048
128	1	86	23	-25.39	80.94	.754	-.052	.009	<.001
		87	21	726.55	589.85	.218	<.001	<.001	.407
		88	2	-610.82	4,133.56	.883	-.014	.017	.432
		89	214	57.98	61.29	.344	-.001	.004	.742
		90	55	57.01	88.49	.519	<.001	<.001	.857
		91	294	597.99	635.28	.347	.081	.007	<.001
		92	112	503.07	285.51	.078	.021	.003	<.001
		93	2	222.25	1,020.11	.828	.027	.005	<.001
		94	67	91.22	38.68	.018	.007	.004	.111
		95	98	-299.89	86.38	.001	.010	.004	.012
		96	473	-38.04	53.71	.479	-.005	.002	.025
		97	34	1,345.10	363.18	<.001	-.002	.001	.021
		98	80	3,585.69	596.85	<.001	-.006	.001	<.001
		99	51	118.57	43.61	.007	.005	.006	.340
	3	100	5	434.58	404.69	.283	<.001	<.001	<.001
		101	23	870.81	1,673.46	.603	-.013	.007	.064
	6	102	27	10,751.73	7,236.23	.137	.011	.005	.026
320	1	103	14	-455.12	158.43	.004	.089	.005	<.001
		104	27	75.18	99.09	.448	.003	.003	.228
		105	258	1,245.37	148.19	<.001	.001	.001	.408
		106	16	46.47	57.94	.422	.006	.003	.049
		107	28	707.78	294.71	.016	<.001	<.001	.325
		108	16	-528.86	146.67	<.001	.118	.006	<.001
		109	18	-116.02	338.38	.732	.094	.005	<.001
	2	110	27	5,753.88	1,996.54	.004	.001	.001	.609

Notes: Jackknife-based standard errors are presented. Treated cases is the number of treated units. In case of one treated case, placebo-based standard errors are presented.

Table W19. Weeks 27–52: Effect of Bottle Bills Aggregated to Package Size Level

Package Size in fl. oz.	# of UPCs	Treated Cases	Volume Sales			Price		
			Est.	SE	p-value	Est.	SE	p-value
8	5	443	-77.23	113.94	.498	.424	.024	<.001
11	1	244	-244.41	185.80	.188	.441	.031	<.001
16.9	46	3,632	-2,216.17	815.19	.007	.149	.016	<.001
20	17	2,819	63.96	21.12	.002	.231	.015	<.001
23.7	3	719	-26.32	52.75	.618	.143	.014	<.001
33.8	13	2,630	45.83	29.93	.126	.070	.021	.001
101.4	2	721	814.99	148.79	<.001	.012	.003	<.001
128	17	2,026	549.39	373.48	.141	.015	.004	<.001
320	8	518	1,188.22	281.46	<.001	.013	.002	<.001

Notes: Estimates and standard errors are the weighted mean (using the number of treated cases as weight) across the UPC-level values, presented in Table W18. "# of UPCs" reflects the number of UPCs belonging to a package size.

Table W20. DID: Effect of Bottle Bills on Volume Sales and Retail Prices by UPC

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales (Eq. W6) Est. ($\hat{\tau}_u^S$)	SE	p-val.	Price (Eq. W5) Est. ($\hat{\tau}_u^P$)	SE	p-val.
8	8	1	144	-24.61	35.80	.492	.624	.066	<.001
	12	2	145	37.39	167.90	.824	.308	.056	<.001
		3	69	358.98	81.03	<.001	.003	.010	.776
		4	41	-224.54	73.28	.002	.178	.038	<.001
	24	5	44	809.02	278.81	.004	-.005	.012	.670
11	8	6	244	-349.97	133.28	.009	.458	.060	<.001
16.9	1	7	34	-36.78	16.24	.024	.375	.021	<.001
		8	4	-875.72	417.27	.036	-.017	.053	.746
		9	13	-136.62	50.32	.007	<.001	<.001	<.001
		10	43	12.50	7.55	.098	-.022	.009	.014
		11	41	1.75	19.92	.930	-.357	.069	<.001
		12	185	-17.72	10.45	.090	.542	.037	<.001
		13	29	12.51	7.64	.102	1.241	.117	<.001
		14	52	-7.14	5.98	.232	.298	.078	<.001
		15	2	105.06	67.46	.119	.012	.022	.593
		16	1	-85.97	202.61	.671	-.123	.116	.288
		17	15	56.98	33.98	.094	.035	.064	.583
	6	18	16	-53.54	26.69	.045	.325	.016	<.001
		19	40	-57.64	25.84	.026	.474	.036	<.001
		20	1	11.58	177.26	.948	.278	.010	<.001
		21	43	71.18	35.67	.046	-.001	.002	.461
		22	41	29.34	34.63	.397	-.001	.001	.505
		23	43	-6.85	57.35	.905	-.001	.001	.501
		24	42	35.01	36.76	.341	-.002	.001	.266
		25	42	4.63	40.32	.909	-.005	.001	<.001
		26	42	28.80	39.66	.468	-.003	.001	.062
		27	43	27.47	40.70	.500	-.003	.001	.024
		28	288	-584.97	110.19	<.001	.116	.013	<.001
		29	15	5.06	37.46	.893	.346	.065	<.001
		30	198	-49.22	19.35	.011	.287	.018	<.001
		31	43	202.68	72.40	.005	<.001	<.001	.369
		32	66	378.38	66.64	<.001	-.001	.018	.942
	12	33	44	-11.79	44.49	.791	.002	.002	.381
		34	37	30.72	48.66	.528	<.001	.002	.811
		35	7	-316.39	796.26	.691	<.001	<.001	.983
		36	97	-18.02	109.64	.869	.346	.023	<.001
		37	40	597.15	162.31	<.001	-.001	<.001	.035
		38	67	380.28	66.62	<.001	-.001	.009	.877
	15	39	77	254.38	86.45	.003	-.018	.008	.029
	24	40	406	-7,564.17	633.65	<.001	.230	.008	<.001
		41	251	-3,111.04	341.46	<.001	.275	.009	<.001
		42	33	346.81	529.50	.512	.013	.012	.252
		43	205	-2,522.18	525.11	<.001	.075	.008	<.001
		44	272	-11,407.78	3,313.50	.001	.109	.010	<.001
		45	429	737.88	89.86	<.001	.012	.001	<.001
		46	43	1,407.49	1,722.13	.414	.007	<.001	<.001
		47	133	-844.06	295.39	.004	.016	.005	.001
		48	101	4,569.43	4,244.57	.282	<.001	.005	.965
	28	49	1	-10,093.92	461.45	<.001	-.125	.034	<.001
	30	50	7	-12,042.41	3,000.50	<.001	.094	.028	.001
20	1	51	1,135	31.28	7.68	<.001	.353	.020	<.001
		52	1,021	45.49	5.98	<.001	.306	.010	<.001
		53	2	36.17	147.62	.807	.042	.011	<.001
		54	2	299.39	155.52	.054	-.392	.184	.033
		55	10	13.31	16.54	.421	-.015	.016	.348
		56	7	-30.97	21.39	.148	.009	.014	.540
		57	8	18.15	14.53	.212	-.008	.017	.626
		58	11	13.46	14.39	.350	-.011	.008	.177
		59	419	103.99	23.92	<.001	.006	.006	.260
	4	60	1	8.47	14.98	.572	-.029	.012	.016
		61	1	41.49	32.48	.202	-.013	.011	.212
		62	14	-16.49	17.93	.358	-.239	.013	<.001
		63	26	-35.95	20.45	.079	-.005	.005	.287
		64	18	-33.66	18.64	.071	.005	.008	.533
		65	10	-38.69	13.38	.004	.013	.011	.228

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales (Eq. W6) Est. ($\hat{\tau}_u^S$)	SE	p-val.	Price (Eq. W5) Est. ($\hat{\tau}_u^P$)	SE	p-val.
	6	66	101	-1.66	17.02	.922	.457	.051	<.001
	24	67	33	489.74	626.02	.434	.005	.009	.601
23.7	1	68	428	31.07	13.41	.021	.032	.014	.019
	6	69	157	-177.70	83.88	.034	.241	.023	<.001
	12	70	134	-125.78	106.23	.236	.195	.019	<.001
33.8	1	71	476	20.50	11.60	.077	.259	.018	<.001
		72	10	-8.53	29.04	.769	.256	.035	<.001
		73	70	60.51	19.62	.002	.080	.006	<.001
		74	618	55.10	16.19	.001	.163	.008	<.001
		75	4	52.23	104.63	.618	.023	.011	.041
		76	156	81.61	32.25	.011	-.132	.031	<.001
		77	251	27.50	19.23	.153	.049	.037	.185
		78	311	-55.20	11.69	<.001	.499	.028	<.001
		79	507	56.53	39.23	.150	-.189	.023	<.001
		80	37	39.66	12.28	.001	-.028	.032	.369
		81	82	46.10	31.72	.146	.007	.014	.650
	6	82	52	27.42	56.71	.629	.123	.042	.003
		83	56	188.07	73.88	.011	.239	.026	<.001
101.4	1	84	646	932.77	164.82	<.001	.011	.003	.001
		85	75	1,615.44	264.00	<.001	.001	.005	.819
128	1	86	29	110.86	146.78	.450	-.052	.011	<.001
		87	27	61.70	930.16	.947	-.008	.005	.119
		88	2	-1,992.06	1,043.61	.057	.015	.006	.014
		89	274	50.17	63.87	.432	-.012	.004	.006
		90	70	-6.10	64.79	.925	<.001	<.001	.257
		91	377	369.84	901.74	.682	.106	.011	<.001
		92	144	488.44	301.63	.105	.042	.016	.008
		93	2	-87.00	190.62	.648	.018	.005	.001
		94	86	27.58	37.57	.463	-.004	.004	.309
		95	126	-292.12	74.84	<.001	.011	.004	.002
		96	606	-44.82	42.00	.286	-.033	.003	<.001
		97	44	1,402.91	346.98	<.001	-.001	.001	.115
		98	103	3,579.50	667.49	<.001	-.022	.003	<.001
		99	66	179.45	52.43	.001	.002	.005	.708
	3	100	7	-91.37	337.74	.787	<.001	<.001	<.001
		101	29	997.23	1,431.13	.486	.031	.003	<.001
	6	102	34	12,258.63	7,368.75	.096	.003	.006	.657
320	1	103	18	-357.68	133.43	.007	.068	.004	<.001
		104	35	124.61	100.90	.217	.002	.002	.149
		105	331	1,195.97	132.05	<.001	-.040	.006	<.001
		106	21	62.42	46.29	.177	.006	.003	.027
		107	36	781.34	312.83	.013	-.022	.008	.005
		108	20	-431.79	176.01	.014	.074	.007	<.001
		109	23	-440.18	355.17	.215	.060	.006	<.001
	2	110	34	5,551.43	1,975.59	.005	-.001	.001	.109

Notes: Clustered standard errors (by store) are presented. Treated cases is the number of treated units.

Table W21. DID: Effect of Bottle Bills Aggregated to Package Size Level

Package Size in fl. oz.	# of UPCs	Treated Cases	Volume Sales Est.	Volume Sales SE	Volume Sales p-value	Price Est.	Price SE	Price p-value
8	5	443	119.73	113.69	.292	.320	.046	<.001
11	1	244	-349.97	133.28	.009	.458	.060	<.001
16.9	46	3,632	-1,902.73	570.95	.001	.142	.013	<.001
20	17	2,819	49.76	17.64	.005	.269	.015	<.001
23.7	3	719	-43.75	46.10	.343	.108	.017	<.001
33.8	13	2,630	36.69	23.24	.114	.115	.021	<.001
101.4	2	721	1,003.79	175.14	<.001	.010	.003	.004
128	17	2,026	518.04	423.13	.221	.010	.006	.071
320	8	518	1,145.21	271.69	<.001	-.019	.005	<.001

Notes: Estimates and standard errors are the weighted mean (using the number of treated cases as weight) across the UPC-level values, presented in Table W20. "# of UPCs" reflects the number of UPCs belonging to a package size.

Table W22. DID: Effect of Bottle Bills on Volume Sales and Retail Prices by UPC (Controls based on Pre-Treatment Correlation)

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales (Eq. W6) Est. ($\hat{\tau}_u^S$)	SE	p-val.	Price (Eq. W5) Est. ($\hat{\tau}_u^P$)	SE	p-val.
8	8	1	144	-5.62	37.33	.880	.759	.081	<.001
	12	2	145	-189.18	159.70	.236	.403	.067	<.001
		3	69	356.98	86.79	<.001	.010	.010	.340
		4	41	-240.35	76.60	.002	.228	.043	<.001
	24	5	44	536.50	364.72	.141	.016	.006	.010
11	8	6	244	-171.35	164.23	.297	.374	.069	<.001
16.9	1	7	34	-41.01	21.03	.051	.393	.026	<.001
		8	4	-1,290.36	465.90	.006	.003	.058	.953
		9	13	-144.15	48.86	.003	<.001	<.001	<.001
		10	43	13.33	8.04	.097	-.018	.007	.018
		11	41	-185.63	126.89	.144	.250	.093	.007
		12	185	-21.36	22.44	.341	-.292	.087	.001
		13	29	19.88	10.84	.067	.282	.049	<.001
		14	52	12.51	7.56	.098	1.241	.116	<.001
		15	2	-6.14	6.27	.328	.170	.081	.036
		16	1	93.40	68.56	.173	.002	.027	.930
		17	15	-85.97	202.61	.671	-.123	.116	.288
	6	18	16	45.70	46.22	.323	-.045	.087	.606
		19	40	-15.85	24.84	.523	.371	.016	<.001
		20	1	-42.32	28.08	.132	.586	.036	<.001
		21	43	-3.56	82.83	.966	.343	.018	<.001
		22	41	70.17	42.20	.096	<.001	.001	.808
		23	43	17.99	40.14	.654	.001	.001	.591
		24	42	5.94	64.94	.927	<.001	.001	.867
		25	42	31.91	42.38	.452	<.001	.001	.757
		26	42	26.11	43.81	.551	-.003	.001	.001
		27	43	47.74	40.52	.239	-.002	.001	.094
		28	288	27.17	46.41	.558	-.001	.001	.360
		29	15	-313.84	113.14	.006	.161	.016	<.001
		30	198	3.17	24.06	.895	.543	.072	<.001
		31	43	-22.15	22.19	.318	.269	.022	<.001
		32	66	107.62	93.75	.251	<.001	<.001	.456
	12	33	44	375.99	66.67	<.001	.011	.014	.437
		34	37	-2.08	44.87	.963	.002	.002	.284
		35	7	1.42	50.23	.978	.001	.002	.769
		36	97	-271.48	788.49	.731	<.001	<.001	.999
		37	40	43.38	115.58	.707	.350	.024	<.001
		38	67	544.77	183.91	.003	-.001	<.001	.027
	15	39	77	325.39	93.50	.001	.005	.009	.563
	24	40	406	42.96	191.06	.822	.029	.017	.081
		41	251	368.68	98.42	<.001	-.009	.009	.291
		42	33	-4,462.51	879.82	<.001	.236	.010	<.001
		43	205	-2,029.39	499.69	<.001	.254	.011	<.001
		44	272	673.31	632.54	.287	.003	.014	.826
		45	429	-2,453.65	679.52	<.001	.074	.008	<.001
		46	43	-19,719.51	5,682.91	.001	.141	.009	<.001
		47	133	434.28	120.89	<.001	.016	.002	<.001
		48	101	1,657.63	1,923.59	.389	.007	<.001	<.001
	28	49	1	-285.27	309.49	.357	.021	.005	<.001
	30	50	7	11,018.99	1,500.27	<.001	<.001	.003	.998
20	1	51	1,135	-10,093.92	461.45	<.001	-.125	.034	<.001
		52	1,021	-12,328.43	3,047.58	<.001	.094	.028	.001
		53	2	23.60	8.77	.007	.413	.053	<.001
		54	2	30.31	11.53	.009	.395	.025	<.001
		55	10	-106.38	55.76	.056	.388	.037	<.001
		56	7	448.25	277.87	.107	-.599	.364	.100
		57	8	12.58	13.34	.345	-.263	.114	.021
		58	11	-30.97	20.72	.135	.009	.014	.527
		59	419	19.56	14.34	.173	-.006	.017	.705
	4	60	1	13.34	14.21	.348	-.011	.008	.173
		61	1	-88.12	38.15	.021	.028	.006	<.001
		62	14	20.69	16.78	.218	-.034	.010	.001
		63	26	-8.64	21.20	.684	-.013	.011	.236
		64	18	-.96	19.56	.961	-.230	.013	<.001
		65	10	-31.75	22.95	.166	.008	.005	.119

Package Size in fl. oz.	Multipack	UPC (ID)	Treated Cases	Volume Sales (Eq. W6) Est. ($\hat{\tau}_u^S$)	SE	p-val.	Price (Eq. W5) Est. ($\hat{\tau}_u^P$)	SE	p-val.
	6	66	101	-9.78	21.94	.656	.015	.008	.063
	24	67	33	-7.94	20.48	.698	.027	.011	.017
23.7	1	68	428	71.80	25.80	.005	.362	.058	<.001
	6	69	157	789.82	692.62	.254	-.009	.011	.444
	12	70	134	55.88	22.59	.013	.107	.019	<.001
33.8	1	71	476	-89.36	117.80	.448	.259	.027	<.001
		72	10	-84.72	118.31	.474	.214	.022	<.001
		73	70	24.28	17.13	.156	.352	.030	<.001
		74	618	-8.53	28.28	.763	.256	.035	<.001
		75	4	57.22	29.79	.055	.065	.005	<.001
		76	156	6.12	17.45	.726	.234	.017	<.001
		77	251	-22.75	122.89	.853	.018	.013	.154
		78	311	104.41	55.28	.059	-.165	.059	.005
		79	507	35.10	21.33	.100	-.001	.042	.977
		80	37	102.39	19.48	<.001	.484	.046	<.001
		81	82	133.02	55.88	.017	.266	.037	<.001
	6	82	52	28.20	16.26	.083	-.039	.033	.235
		83	56	70.81	33.19	.033	-.030	.015	.048
101.4	1	84	646	-24.97	57.65	.665	.231	.047	<.001
		85	75	-4.03	36.85	.913	.284	.031	<.001
128	1	86	29	465.44	175.12	.008	.064	.009	<.001
		87	27	2,265.45	455.46	<.001	.002	.005	.662
		88	2	16.35	147.20	.912	-.043	.011	<.001
		89	274	841.20	800.78	.294	<.001	.002	.884
		90	70	-919.66	649.10	.157	.024	.012	.054
		91	377	85.11	55.26	.124	-.006	.004	.170
		92	144	-75.57	74.39	.310	<.001	<.001	.242
		93	2	-1,686.63	1,606.90	.294	.089	.028	.002
		94	86	-27.41	238.84	.909	.124	.035	<.001
		95	126	-87.00	186.07	.640	.018	.005	.001
		96	606	100.70	40.30	.012	-.005	.004	.256
		97	44	-225.88	83.92	.007	.006	.004	.132
		98	103	-16.06	49.12	.744	.005	.005	.325
		99	66	1,236.19	356.52	.001	<.001	.001	.635
	3	100	7	3,181.33	686.89	<.001	-.023	.003	<.001
		101	29	189.01	99.75	.058	.010	.006	.090
	6	102	34	-91.37	326.27	.779	<.001	<.001	<.001
320	1	103	18	1,159.17	1,329.16	.383	.037	.001	<.001
		104	35	11,847.02	7,100.31	.095	.003	.007	.684
		105	331	-357.68	131.09	.006	.068	.004	<.001
		106	21	164.45	105.15	.118	.003	.002	.088
		107	36	918.56	161.54	<.001	-.012	.007	.108
		108	20	86.43	50.80	.089	.006	.003	.046
		109	23	730.80	414.00	.078	-.001	.006	.899
	2	110	34	-421.57	171.30	.014	.074	.006	<.001

Notes: Clustered standard errors (by store) are presented. Treated cases is the number of treated units.

Table W23. DID (Controls based on Pre-Treatment Correlation): Effect of Bottle Bills Aggregated to Package Size Level

Package Size in fl. oz.	# of UPCs	Treated Cases	Volume Sales			Price		
			Est.	SE	p-value	Est.	SE	p-value
8	5	443	-33.12	131.39	.801	.403	.058	<.001
11	1	244	-171.35	164.23	.297	.374	.069	<.001
16.9	46	3,632	-1,812.10	695.08	.009	.143	.016	<.001
20	17	2,819	15.91	23.61	.500	.330	.034	<.001
23.7	3	719	-2.04	61.22	.973	.160	.021	<.001
33.8	13	2,630	59.48	29.57	.044	.252	.032	<.001
101.4	2	721	624.26	199.85	.002	.059	.008	<.001
128	17	2,026	82.19	493.68	.868	.032	.012	.011
320	8	518	963.74	302.77	.001	.001	.006	.879

Notes: Estimates and standard errors are the weighted mean (using the number of treated cases as weight) across the UPC-level values, presented in Table W22. "# of UPCs" reflects the number of UPCs belonging to a package size.

Web Appendix J: Scenario Analysis on Retailer Costs

Retailers often oppose bottle bills by arguing that they receive insufficient compensation for the additional costs of handling bottle deposit systems.[3] Yet these additional costs are rarely reported, so such claims are hard to verify. In an attempt to do so, we use our estimates and reasonable assumptions about product gross margins to quantify the costs through a comparison of multiple scenarios. That is, we evaluate a retailer's profit in (a) a baseline scenario without a bottle bill and (b) a scenario in which the bottle bill is introduced and retailers adjust their prices. To facilitate the comparison, we normalize the total amount of *bottles* sold in scenario a (sales^{a}) to 100. We disentangle the sales into bottles covered by the bottle bill (<128 fl. oz.) and uncovered ones (≥128 fl. oz.), or sales^{a}_{cov} and sales^{a}_{unc}, respectively. The sales for scenario b (sales^{b}) are relative to the sales for scenario a. We also differentiate the average price for covered (Price_{cov}) and uncovered (Price_{unc}) bottles, normalizing them to the price of covered bottles in scenario a (on average, 100.82¢ per bottle).

Table W24. Bottle Sales and Price of Covered and Uncovered Bottles in Two Scenarios

	Scenario	Sales			Price	
		Covered	Uncovered	Total	Covered	Uncovered
a	No bottle bill	93.52	6.48	100.00	1.00	1.63
b	Bottle bill with price changes	81.62	6.59	88.21	1.04	1.65

Assuming a retailer's gross margin of m, we can calculate a profit for the baseline scenario of no bottle bill as follows:

$$\text{Profit}^{a} = (\text{sales}^{a}_{cov} * \text{price}^{a}_{cov} * m) + (\text{sales}^{a}_{unc} * \text{price}^{a}_{unc} * m) \quad \text{(W7)}$$

Furthermore, we define the cost for covered bottles as $c^{a}_{cov} = \text{price}^{a}_{cov} * (1 - m)$, and the cost for uncovered bottles as $c^{a}_{unc} = \text{price}^{a}_{unc} * (1 - m)$. To calculate the profits for scenario b, we need information about the reimbursements and additional costs for retailers, next to their price changes. As described in the main text, retailers retain 3.5¢ per returned bottle. Assuming a 70% return rate, the average reimbursement received for covered bottles would be 2.45¢ (i.e., $2.45¢ = 70\% * 3.5¢$). With a normalized Price^{a}_{cov} of 1, we rescale the average reimbursement in scenario b (r_{cov}) by the average price in scenario b ($\frac{2.45¢}{(1.04*100.82¢)} = .023$), implying that retailers receive

[3] As discussed in the main text, these costs may relate to additional staffing costs and maintenance of the bottle deposit facilities, increased costs of keeping stores clean, and the opportunity costs of floor space for return systems.

2.3% of the average bottle price for each covered bottle they sell.

To denote the (unobserved) additional cost in scenario b (ac) imposed on the retailer, we can express it as a fraction of the price of bottles sold in the respective scenario. That is, if a retailer incurs a cost of 5¢, we scale it to the average price in the scenario a (i.e., 5¢/100.82¢ = .0496).

As the changes in reimbursements, additional costs, and changes in price affect the margin, we can rewrite the margin in scenario b as a function of these

$$\mathrm{m}^{\mathrm{b}}_{\mathrm{cov}} = \frac{\mathrm{price}^{\mathrm{b}}_{\mathrm{cov}} - \mathrm{c}^{\mathrm{b}}_{\mathrm{cov}}}{\mathrm{price}^{\mathrm{b}}_{\mathrm{cov}}},$$

where $\mathrm{price}^{\mathrm{b}}_{\mathrm{cov}} = \mathrm{price}^{\mathrm{a}}_{\mathrm{cov}} + \Delta\mathrm{Price}^{\mathrm{b}}_{\mathrm{cov}}$, and $\mathrm{c}^{\mathrm{b}}_{\mathrm{cov}} = \mathrm{c}^{\mathrm{a}}_{\mathrm{cov}} - \mathrm{r}^{\mathrm{b}}_{\mathrm{cov}} + \mathrm{ac}$. Substituting these in, we obtain:

$$\mathrm{m}^{\mathrm{b}}_{\mathrm{cov}} = \frac{\mathrm{price}^{\mathrm{a}}_{\mathrm{cov}} + \Delta\mathrm{Price}^{\mathrm{b}}_{\mathrm{cov}} - (\mathrm{price}^{\mathrm{a}}_{\mathrm{cov}} * (1 - \mathrm{m}) - \mathrm{r}_{\mathrm{cov}} + \mathrm{ac})}{\mathrm{price}^{\mathrm{a}}_{\mathrm{cov}} + \Delta\mathrm{Price}^{\mathrm{b}}_{\mathrm{cov}}}$$

$$= \frac{\mathrm{price}^{\mathrm{a}}_{\mathrm{cov}} + \Delta\mathrm{Price}^{\mathrm{b}}_{\mathrm{cov}} - (\mathrm{price}^{\mathrm{a}}_{\mathrm{cov}} * (1 - \mathrm{m}) - \mathrm{r}_{\mathrm{cov}} + \mathrm{ac})}{\mathrm{price}^{\mathrm{a}}_{\mathrm{cov}} + \Delta\mathrm{Price}^{\mathrm{b}}_{\mathrm{cov}}}$$

For uncovered bottles, we assume no additional costs and reimbursements, which simplifies the new margin to the following

$$\mathrm{m}^{\mathrm{b}}_{\mathrm{unc}} = \frac{\mathrm{price}^{\mathrm{a}}_{\mathrm{unc}} + \Delta\mathrm{Price}^{\mathrm{b}}_{\mathrm{unc}} - (\mathrm{price}^{\mathrm{a}}_{\mathrm{unc}} * (1 - \mathrm{m}))}{\mathrm{price}^{\mathrm{a}}_{\mathrm{unc}} + \Delta\mathrm{Price}^{\mathrm{b}}_{\mathrm{unc}}}$$

Then we can express the profit in scenario b as a function of two parts: sales of covered bottles multiplied by their price and their revised retailer margin $\mathrm{m}^{\mathrm{b}}_{\mathrm{cov}}$, which takes into account the reimbursement and increased cost per bottle sold and price changes for covered bottles, and then sales of uncovered bottles multiplied by their price and respective margin and price changes. Formally,

$$\mathrm{Profit}^{\mathrm{b}} = \left(\mathrm{sales}^{\mathrm{b}}_{\mathrm{cov}} * \mathrm{price}^{\mathrm{b}}_{\mathrm{cov}} * \mathrm{m}^{\mathrm{b}}_{\mathrm{cov}}\right) + \left(\mathrm{sales}^{\mathrm{b}}_{\mathrm{unc}} * \mathrm{price}^{\mathrm{b}}_{\mathrm{unc}} * \mathrm{m}^{\mathrm{b}}_{\mathrm{unc}}\right) \quad \text{(W8)}$$

If the additional costs equal the reimbursement, no price change is required to retain the same profit and any additional price increases would increase profit.

All quantities, except for the additional costs (ac) and margin (m), are empirical quantities obtained from our estimates and data, so we can update Equations W7–W8 with these values and evaluate profit implications for different values for the additional costs and margin. We focus on the following question: At what level of additional costs is the bottle bill profit-neutral for retailers, given the observed price changes? We elaborate below.

First, we determine at which level of additional costs retailers retain the same profit in scenario a (no bottle bill) and scenario b (bottle bill and price adjustments). This scenario informs us about the level of additional costs at which the bottle bill is profit-neutral while accounting for price adjustments. To do so, we solve $\text{Profit}^{a} = \text{Profit}^{b}$, assuming a range of reasonable margins. Plugging in all relevant quantities (as shown in Table W24), we obtain:

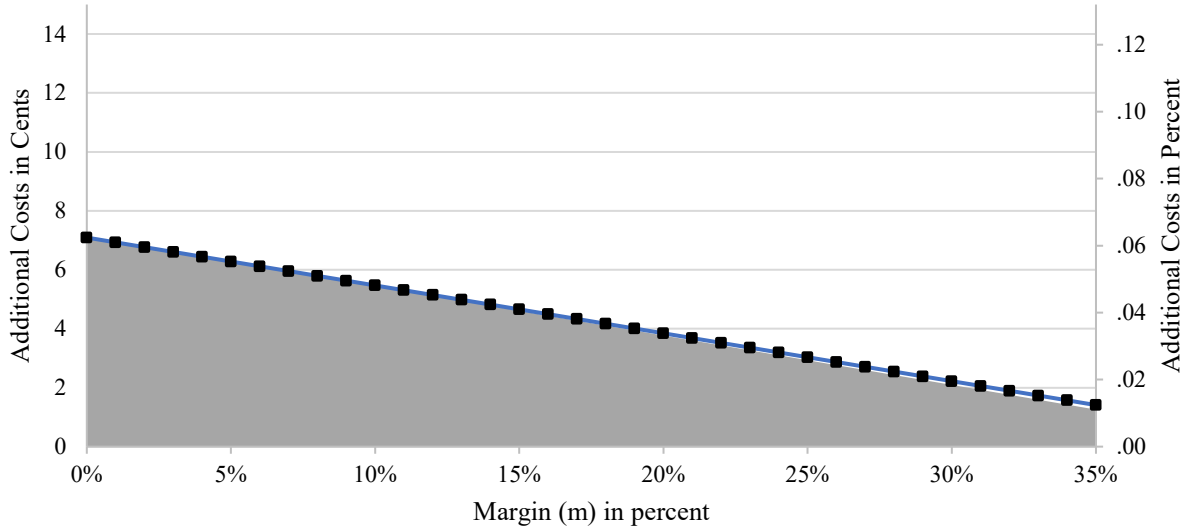
$$\text{Profit}^{a} = \left(\underbrace{93.52}_{\text{sales}^{a}_{cov}} * \underbrace{1.00}_{\text{price}^{a}_{cov}} * \text{m}\right) + \left(\underbrace{6.48}_{\text{sales}^{a}_{unc}} * \underbrace{1.63}_{\text{price}^{a}_{unc}} * \text{m}\right)$$

and

$$\text{Profit}^{b} = \left(\underbrace{81.62}_{\text{sales}^{b}_{cov}} * \underbrace{1.04}_{\text{price}^{b}_{cov}} * \underbrace{\frac{\underbrace{1.00}_{\text{price}^{a}_{cov}} + \underbrace{.04}_{\Delta\text{Price}^{b}_{cov}} - \left(\underbrace{1.00}_{\text{price}^{a}_{cov}} * (1 - \text{m}) - \underbrace{.023}_{\text{r}^{b}_{cov}} + \text{ac}^{b}\right)}{\underbrace{1.00}_{\text{price}^{a}_{cov}} + \underbrace{.04}_{\Delta\text{Price}^{b}_{cov}}}}_{\text{m}^{b}_{cov}}\right) + \left(\underbrace{6.59}_{\text{sales}^{b}_{unc}} * \underbrace{1.65}_{\text{price}^{b}_{unc}} * \underbrace{\frac{\underbrace{1.63}_{\text{price}^{a}_{unc}} + \underbrace{.01}_{\Delta\text{Price}^{b}_{unc}} - \left(\underbrace{1.63}_{\text{price}^{a}_{unc}} * (1 - \text{m})\right)}{\underbrace{1.63}_{\text{price}^{a}_{unc}} + \underbrace{.01}_{\Delta\text{Price}^{b}_{unc}}}}_{\text{m}^{b}_{unc}}\right)$$

When solving $\text{Profit}^{a} = \text{Profit}^{b}$ for different values of m we obtain Figure W6. The black line indicates the additional costs ac at which $\text{Profit}^{a} = \text{Profit}^{b}$, over a range of gross margins (0%–35%). The shaded area under the line reveals the values of additional costs for which retailers' profits would increase in scenario b. For example, if the gross margin is 10% and handling costs are less than 5.09% (or 5.12¢ per bottle), retailers obtain an increased gross profit in the scenario with a bottle bill and price adjustments.

Figure W6. Additional Costs Value Thresholds for Retailers to Lose Profits in Scenario b



In summary, the additional costs must be substantial for retailers to be worse off with the price adjustments compared with before the bottle bill. At low margins, the additional costs would need to be higher than 6% (6¢) to make the profits after the bottle bill lower than before. At a margin of 28.4%, it would need to exceed the average reimbursement of 2.45¢ to make retailers worse off after the bottle bill.

Deriving the Slope Analytically

Profit scenario a: We first simplify the profit in scenario a (Equation W7) by plugging sales and price values in: $\text{Profit}^{a} = 104.11 * \text{m}$.

Profit scenario b: To simplify the profit equation in scenario b, we first split it into the covered Profit^{b}_{cov} and uncovered profit Profit^{b}_{unc}.

Covered bottles: The profit on covered bottles is $\text{Profit}^{b}_{cov} = \text{sales}^{b}_{cov} * \text{price}^{b}_{cov} * \text{m}^{b}_{cov}$. We can rewrite m^{b}_{cov} as follows: $\text{m}^{b}_{cov} = \frac{\text{m}+.064-\text{ac}^{b}}{1.04}$.

When we plug m^{b}_{cov} back into Profit^{b}_{cov} and cancel out redundant terms, we get:

$\text{Profit}^{b}_{cov} = 81.62m + 5.24 - 81.62\text{ac}^{b}$.

Uncovered bottles: The profit on uncovered bottles $\left(\text{Profit}^{b}_{unc} = \left(\text{sales}^{b}_{unc} * \text{price}^{b}_{unc} * \text{m}^{b}_{unc}\right)\right)$ has a margin (m^{b}_{unc}). We rewrite m^{b}_{unc} in the following manner

$$\text{m}^{b}_{unc} = \frac{1.65 - \left(\underbrace{1.63}_{\text{price}^{a}_{unc}} * (1 - \text{m})\right)}{1.65} = \frac{1.65 - (1.63 - 1.63\text{m}))}{1.65}$$

$$\text{m}^{b}_{unc} = \frac{.01 - 1.63\text{m}}{1.65}$$

We plug this into Profit^{b}_{unc} to obtain: $\text{Profit}^{b}_{unc} = 6.59 * (.01 - 1.63\text{m}) = .053 + 10.759\text{m}$.

Combining Profit^{b}_{unc} and Profit^{b}_{cov} to the total profit in scenario b (Profit^{b}) we get

$$\text{Profit}^{b} = 92.381m + 5.29 - 81.6\text{ac}^{b}$$

Equating profits across scenarios and solving for the additional cost:

Now we can equate $\text{Profit}^{a} = \text{Profit}^{b}$, and solve for ac^{b}:

$$\text{ac}^{b} = .0648 - .144\text{m}$$

If $\text{ac}^{b} < .0648 - .144\text{m}$, the profits are higher in scenario b (with the bottle bill), whereas if $\text{ac}^{b} > .0648 - .144\text{m}$, the profits are lower with the bottle bill. The slope in Figure W6 is represented by $\text{ac}^{b} = .0648 - .144\text{m}$.

Web Appendix K: Parameter Estimates Ideological Aversion

Table W25. Parameter Estimates Ideological Aversion and Sales Changes (Equation 3)

Dependent Variable = Volume Sales Change	Focal Model N = 409 Est.	Absolute Sales N = 409 Est.	Trimmed at 1% N = 399 Est.	Additional Control (Income) N = 409 Est.	Additional Controls (Env. Responsibility) N = 409 Est.	Additional Control (HH Size) N = 409 Est.	Discretized Package Size N = 409 Est.	Weighted-Least Squares N = 409 Est.	Alt. Measure of Urbanicity (Share) N = 409 Est.	Alt. Measure of Urbanicity (Binary) N = 409 Est.
Share Democrats	129.949	1628.553	58.476	156.307	94.324	106.703	175.930	36.088	99.708	113.164
	(39.849)	(753.908)	(17.241)	(51.955)	(49.016)	(51.613)	(5.372)	(14.084)	(34.984)	(33.423)
	[.001]	[.031]	[.001]	[.003]	[.055]	[.039]	[.001]	[.011]	[.005]	[.001]
Package Size	.074	5.102	.067	.075	.077	.077		.048	.074	.040
	(.024)	(.897)	(.013)	(.024)	(.024)	(.024)		(.008)	(.024)	(.036)
	[.003]	[<.001]	[<.001]	[.002]	[.002]	[.001]		[<.001]	[.002]	[.272]
Share Democrats x Package Size	-.902	-6.338	-.393	-1.069	-.776	-.852		-.342	-.749	-.775
	(.294)	(6.908)	(.145)	(.387)	(.361)	(.382)		(.102)	(.268)	(.260)
	[.002]	[.359]	[.007]	[.006]	[.032]	[.026]		[.001]	[.005]	[.003]
Housing Unit Size	11.030	167.590	.028	19.691	7.133	-.305	11.106	1.894		
	(13.394)	(214.567)	(3.696)	(16.385)	(15.969)	(17.139)	(13.484)	(2.905)		
	[.411]	[.435]	[.994]	[.230]	[.655]	[.986]	[.411]	[.515]		
Housing Unit Size x Package Size	-.127	1.337	-.053	-.190	-.136	-.096	-.094	-.027		
	(.096)	(2.698)	(.035)	(.128)	(.123)	(.130)	(.087)	(.027)		
	[.185]	[.621]	[.133]	[.138]	[.270]	[.460]	[.281]	[.313]		
Income				-.137	-.072	-.079				
				(.105)	(.102)	(.102)				
				[.192]	[.478]	[.441]				
Income x Package Size				.001	.001	.001				
				(.001)	(.001)	(.001)				
				[.319]	[.403]	[.361]				
Env. Responsibility					172.931	73.951				
					(45.560)	(67.234)				
					[<.001]	[.272]				
Env. Responsibility x Package Size					-.844	-.280				
					(.331)	(.477)				
					[.011]	[.557]				
Household Size						37.472				
						(23.305)				
						[.109]				
Household Size x Package Size						-.216				
						(.165)				
						[.193]				
Non-Covered Package Size							12.167			
							(4.690)			
							[.010]			
Share of Dem. x Non-Covered Package Size							-193.777			
							(51.952)			
							[<.001]			
Urbanicity (Share)									11.699	
									(12.551)	
									[.352]	
Urbanicity (Share) x Package Size									.034	
									(.091)	
									[.706]	
Urbanicity (Binary)										-.628
										(6.384)
										[.922]
Urbanicity (Binary) x Package Size										.045
										(.048)
										[.354]
Average Sales Before		-.066								
		(.033)								
		[.048]								
Intercept	-2.528	279.336	-1.414	-2.488	-2.567	-2.566	-5.414	-.025	-2.496	-2.025
	(3.256)	(92.064)	(1.485)	(3.269)	(3.240)	(3.223)	(4.245)	(1.105)	(3.248)	(4.595)
	[.438]	[.003]	[.342]	[.447]	[.429]	[.426]	[.203]	[.982]	[.443]	[.660]

Notes: Income is operationalized as the average household's annual income in a market (American Community Survey measure S1901). Environmental Responsibility is the average response (5-point Likert scale, 5 = Agree completely) to the question "Each of us has a personal obligation to do what we can to be environmentally friendly", collected by the Simmons National Consumer Study Data (measure 259*63). Household size is the average household size in a market (American Community Survey measure S1101). Values in parentheses are heteroskedasticity-robust standard errors, values in brackets p-values.

Table W26. Parameter Estimates Ideological Aversion and Price Changes (Equation 3)

Dependent Variable = Volume Sales Change	Focal Model	Absolute Sales	Trimmed at 1%	Additional Control (Income)	Additional Controls (Env. Responsibility)	Additional Control (HH Size)	Discretized Package Size	Weighted-Least Squares	Alt. Measure of Urbanicity (Share)	Alt. Measure of Urbanicity (Binary)
	N = 409	N = 409	N = 399	N = 409	N = 409	N = 409	N = 409	N = 409	N = 409	N = 409
	Est.	Est.	Est.	Est.	Est.	Est.	Est.	Est.	Est.	Est.
Share Democrats	4.049	.192	4.409	-1.788	-8.185	-8.489	4.027	4.039	-1.788	-.452
	(2.150)	(.083)	(2.224)	(2.798)	(3.333)	(3.306)	(2.779)	(2.295)	(1.665)	(1.539)
	[.060]	[.021]	[.048]	[.523]	[.014]	[.011]	[.148]	[.079]	[.284]	[.769]
Package Size	-.019	-.001	-.020	-.019	-.019	-.019		-.013	-.019	-.015
	(.002)	(<.001)	(.002)	(.002)	(.002)	(.002)		(.001)	(.002)	(.003)
	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]		[<.001]	[<.001]	[<.001]
Share Democrats x Package Size	-.014	-.001	-.016	.027	.061	.061		-.010	.021	.014
	(.016)	(.001)	(.017)	(.023)	(.027)	(.027)		(.013)	(.012)	(.011)
	[.399]	[.058]	[.332]	[.241]	[.024]	[.022]		[.474]	[.089]	[.219]
Housing Unit Size	2.191	.085	2.308	.277	-1.018	-.832	2.170	2.249		
	(1.040)	(.035)	(1.065)	(1.304)	(1.318)	(1.364)	(1.055)	(.928)		
	[.036]	[.015]	[.031]	[.832]	[.440]	[.542]	[.040]	[.016]		
Housing Unit Size x Package Size	-.013	-.001	-.014	.002	.009	.009	-.011	-.008		
	(.008)	(<.001)	(.008)	(.011)	(.011)	(.012)	(.007)	(.005)		
	[.112]	[.038]	[.100]	[.828]	[.441]	[.459]	[.103]	[.130]		
Income				.030	.037	.037				
				(.011)	(.010)	(.011)				
				[.006]	[<.001]	[<.001]				
Income x Package Size				<.001	<.001	<.001				
				(<.001)	(<.001)	(<.001)				
				[.030]	[.011]	[.011]				
Env. Responsibility					17.820	2.297				
					(3.962)	(5.512)				
					[<.001]	[<.001]				
Env. Responsibility x Package Size					-.098	-.100				
					(.031)	(.044)				
					[.002]	[.023]				
Household Size						-.936				
						(1.199)				
						[.436]				
Household Size x Package Size						.001				
						(.009)				
						[.933]				
Non-Covered Package Size							-3.592			
							(.331)			
							[<.001]			
Share of Dem. x Non-Covered Package Size							-.153			
							(3.290)			
							[.963]			
Urbanicity (Share)									2.225	
									(.884)	
									[.012]	
Urbanicity (Share) x Package Size									-.014	
									(.007)	
									[.044]	
Urbanicity (Binary)										.725
										(.466)
										[.120]
Urbanicity (Binary) x Package Size										-.005
										(.004)
										[.142]
Average Price Before		.013								
		(.005)								
		[.009]								
Intercept	3.176	.070	3.271	3.168	3.160	3.160	4.038	2.904	3.176	2.626
	(.218)	(.016)	(.223)	(.213)	(.205)	(.206)	(.290)	(.221)	(.219)	(.347)
	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]	[<.001]

Notes: Income is operationalized as the average household's annual income in a market (American Community Survey measure S1901). Environmental Responsibility is the average response (5-point Likert scale, 5 = Agree completely) to the question "Each of us has a personal obligation to do what we can to be environmentally friendly", collected by the Simmons National Consumer Study Data (measure 259*63). Household size is the average household size in a market (American Community Survey measure S1101). Values in parentheses are heteroskedasticity-robust standard errors, values in brackets p-values.

Web Appendix L: Impact of Bottle Bill on Purchasing Patterns

Impact of Bottle Bill on Purchasing Patterns: Model Setup

To understand whether the bottle bill induced any shifts for these measures, we estimate two-way fixed effects regression models using household-level fixed effects, an indicator for the *post-bottle bill period,* and an interaction between the *post-bottle bill period* and whether a household is treated (i.e., from New York). Formally:

$$y_{t,h} = \alpha_h + \beta_{1,h} \cdot \text{Post}_t + \beta_{2,h} \cdot (\text{Post}_t \cdot \text{Treat}_h) + \varepsilon_{t,h}, \quad \text{(W9)}$$

where $y_{t,h}$ represents one of the eleven measures[4] that capture water bottle size choices in the pre- and post-bottle bill periods (indexed by t), α_h are household fixed effects and $\beta_{1,h}$ captures the effect of Post (which is 1 after implementation of the bottle bill, 0 before), Treat_h captures whether a household resides and shops in New York, and $\varepsilon_{t,h}$ is an idiosyncratic error. Standard errors are clustered at the household level. Our approach using control households from non-treated markets should be robust to seasonality due to the inclusion of a main effect of the post-period.[5]

Impact of bottle bill on purchasing patterns: Sample description

To estimate equation W9, in which we compare pre- and post-water purchase behavior across several different measures, we use 5,055 households from any US state that have made at least five trips, were observed in the [-52,52] pre/post window of the bottle bill, and purchased water at least three times in the pre- and post period. We follow the main analysis with respect to the distinction between treated and control markets to select treated and control households. Additionally, as households can engage in cross-border shopping, we condition our sample such that treated and control households only shop in markets aligned with their regime.

[4] We model the number of bottles (total, covered, non-covered), volume sales (total, covered, non-covered), shares of covered sizes (volume, number of bottles), and volume per bottle (total, covered, and non-covered).
[5] We thank an anonymous reviewer for suggesting to include a control group to account for seasonality.

Impact of Bottle Bill on Purchasing Patterns: Results

Using 9,662 households (673 treated, 8,989 controls) we find strong support for purchase re-allocations away from covered package sizes. We find a decrease in the number of bottles purchased after the bottle bill is implemented ($\text{Post}_t = 1$) of 7.526 (p = .027), which is substantially stronger in for treated households ($\text{Post}_t \cdot \text{Treat}_h = 1$) with an additional drop of 30.19 (p = .019), adding up to 37.71, equaling just over 11% (pre-bottle bill average number of bottles across treated households: 333). Similar to the findings in our main analysis, the change in the number of bottles is primarily driven by a decrease in purchases for covered bottles for the treated area ($\text{Post}_t \cdot \text{Treat}_h$ = -30.75, p = .015), whereas we do not find a significant main effect (β = -6.549, p = .051). For non-covered bottles, we observe a small but significant main effect of Post ($\beta_{1,h}$ = -.977, p < .001), but no interaction effect ($\beta_{2,h}$ = -.561, p = .579), suggesting that the sales of non-covered bottles remained stable despite the enactment of the bottle bill. Considering the absolute volume of water purchased, we find a negative main effect for all households ($\beta_{1,h}$ = -292.4, p < .001), which is the end result of both a drop in volume of covered sizes ($\beta_{1,h}$ = -153.2, p = .009) as well as non-covered sizes ($\beta_{1,h}$ = -139.2, p < .001). For the interaction effect (i.e., treated households), we only observe a significant effect for covered sizes ($\beta_{2,h}$ = -437.0, p = .049), and not for the total volume ($\beta_{2,h}$ = -431.2, p = .131) and non-covered sizes ($\beta_{2,h}$ = -5.842, p = .968). In relative terms, volume sales dropped an additional 5.5% for treated households (pre-bottle bill average volume across households: 7,858). Combining these insights from the number of bottles and volume, we observe a shift away from covered sizes for treated households. Indeed, our measures related to the share of covered bottles confirm this. While we do not find significant main effects, for the treated households we observe a drop in the share of covered sizes in terms of bottles ($\beta_{2,h}$ = -1.303, p = .066) and volume ($\beta_{2,h}$ = -2.492, p = .002), from

baseline share levels of .89 and .81 respectively. Our third measure, the average volume per bottle, further corroborates our findings. We find no significant main effect of volume per bottle (for all sized, but also split between covered and non-covered sizes), whereas we find a significant interaction effect ($\text{Post}_t \cdot \text{Treat}_h$) for all sizes ($\beta = 1.912$, $p = .049$, effect size of 7.1% [pre-bottle bill average: 26.787 fl. oz.]), as well as for covered sizes ($\beta_{2,h} = 1.106$, $p < .001$), but not for non-covered sizes ($\beta_{2,h} = .806$, $p = .416$), suggesting that treated households primarily increase the volume per bottle for covered sizes. These results show that households in the consumer panel exhibit similar patterns to those observed in the retailer data. We report on the full set of estimates in Table W27.

Table W27. Parameter Estimates Household Composition: Bottle Bill Effects (Equation W9)

	Bottles			Volume			Shares		Volume per bottle		
Dependent Variable	# of Bottles	# of Bottles (covered sizes)	# of Bottles (non-covered sizes)	Volume	Volume (covered sizes)	Volume (non-covered sizes)	Bottles: Share of covered sizes	Volume: Share of covered sizes	Volume per bottle	Volume per bottle (covered sizes)	Volume per bottle (non-covered sizes)
	N = 19,324	N = 19,324	N = 19,324	N = 19,324	N = 19,324	N = 19,324	N = 19,324	N = 19,324	N = 19,324	N = 19,324	N = 19,324
	Est.	Est.	Est.	Est.	Est.	Est.	Est.	Est.	Est.	Est.	Est.
Post_t	-7.526	-6.549	-.977	-292.4	-153.2	-139.2	.022	.018	-.317	-.133	-.184
Standard Error	(3.421)	(3.368)	(.265)	(75.55)	(58.71)	(38.94)	(.188)	(.208)	(.254)	(.060)	(.259)
p-value	.027	.051	<.001	<.001	.009	<.001	.905	.932	.217	.034	.482
$\text{Post}_t \cdot \text{Treat}_h$	-30.19	-30.75	.561	-431.2	-437.0	5.842	-1.303	-2.492	1.912	1.106	.806
Standard Error	(12.07)	(11.89)	(1.113)	(274.0)	(211.3)	(152.5)	(.652)	(.814)	(1.110)	(.330)	(1.114)
p-value	.019	.015	.579	.131	.049	.968	.066	.002	.049	<.001	.416
HH fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Numbers in parentheses represent standard errors, which are clustered at the household level.

Web Appendix M: Additional Information Household-Level Analysis

To estimate equation 4, we rely on households from New York only, again within the [-52,52] pre/post window. Our data consists of 26,132 trips across 1,691 households (with an average number of trips of 15.5 per household), which on average had 16 package-size multipack combinations in their choice set conditional on a trip. As detailed in the main text, we sample from the non-water trips until we obtain the same parity with the number of trips in which water was purchased.

There are three idiosyncrasies of our data that are worth discussing. First, due to the sparseness of the household panel data, we rely on the RMS data to construct package-size multipack price levels. The most disaggregate level at which we can match the RMS and HMS data is at the retailer level. Hence, due to different coverage and partial missing data on which retailer was visited by a household in the consumer panel, our sample consists of households' trips to retailers that are also covered in the RMS panel. Second, not all package sizes are on offer at all retailers.[6] The effect of this variation in alternatives on offer at a retailer is captured through $i \in C_r$, resulting in varying choice sets at the household level. Third, water trips constitute only 13% of all trips in the HMS data. We follow Guyt and Gijsbrechts (2014) and undersample from all trips without water purchase for estimation purposes, such that water is purchased on 50% of all trips. Such choice-based sampling does not bias coefficients if weighting is applied (see, e.g., Manski and McFadden 1981).

We calculate the marginal effects for price for two scenarios: a pre-bottle bill and a post-bottle bill scenario, where for the latter we set prices to the pre-bottle bill levels. This approach enables us to capture composition shifts while keeping prices constant. We follow Train (2009) and derive

[6] In constructing the choice set per retailer, we require a package-size multipack combination to be continuously offered throughout the period of observation. To construct the price at the package size-multipack level, we weight the price of all UPCs on offer within a given package-size multipack by the average market share of that specific UPC within the package-size multipack combination in the preceding four weeks. We set the market share to 0 when we do not observe any sales.

household-level own-price elasticities for each alternative using the household-level posterior mean of the price coefficient for a household. We evaluate these elasticities in two counterfactual data sets that keep the panel of households, trips, and alternatives offered intact but set prices to the median pre-bill log-price ($\overline{\text{Pre_BB_price}_{\text{i}}}$). Market-level elasticities for each alternative (ϵ_{i}) are the share-weighted averages $\epsilon_{\text{i}} = \frac{\sum_{\text{h}}^{\text{H}} \widehat{P_{\text{h,i}}} \cdot \epsilon_{\text{h,i}}}{\sum_{\text{h}}^{\text{H}} \widehat{P_{\text{h,i}}}}$, where $\widehat{P_{\text{h,i}}}$ is the (simulated) choice probability for the alternative-household combination. We then compute share-weighted averages at the package size level and then compare $\epsilon_{\text{s}}^{\text{pre}}$ to $\epsilon_{\text{s}}^{\text{post}}$. Confidence intervals are derived from 500 parameter draws from $\theta \sim \text{N}(\hat{\theta}, \text{V}_{\hat{\theta}})$, where θ is the set of parameters obtained through our mixed logit model. We report on the elasticities in Table W30.

Table W28. Parameter Estimates Household Composition: Price Sensitivity (Equation 4)

Panel A: Mean Estimates

Variable		Estimate	Std. Error	p-value
Price	Pre Bottle Bill	-.757	.019	<.001
	Post Bottle Bill	-.309	.040	<.001
Size in fl. oz.	8	-2.085	.219	<.001
	16.9	.922	.102	<.001
	20	1.685	.125	<.001
	23.7	-1.180	.184	<.001
	33.8	-.592	.217	.006
	101.4	-1.123	.161	<.001
	128	-.472	.126	<.001
	320	-6.629	.863	<.001
Size in fl. oz. * Bottle Bill	Outside option	4.690	.538	<.001
	8	1.929	.602	.001
	16.9	1.793	.494	<.001
	20	1.822	.499	<.001
	23.7	.160	.605	.792
	33.8	1.713	.588	.004
	101.4	2.312	.545	<.001
	128	2.616	.510	<.001
	320	2.150	1.751	.220

Table W29. Correlation between Household-level Parameters (Equation 4)

	Price			Size in fl.oz. * Bottle Bill							
	Pre Bottle Bill	Post Bottle Bill	Outside option	8	16.9	20	23.7	33.8	101.4	128	320
Var	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	.22										
	[.02]										
	<.001										
(2)	.93	1.04									
	[.19]	[.04]									
	<.001	<.001									
(3)	.88	.96	6.82								
	[1.85]	[.31]	[.54]								
	.63	.00	<.001								
(4)	.48	.60	.71	2.95							
	[1.58]	[.28]	[.10]	[.60]							
	.76	.03	<.001	.00							
(5)	.74	.76	.88	.85	2.54						
	[1.27]	[.21]	[.07]	[.04]	[.49]						
	.56	<.001	<.001	<.001	<.001						
(6)	.48	.59	.73	.84	.85	2.63					
	[1.30]	[.23]	[.10]	[.04]	[.02]	[.50]					
	.71	.01	<.001	<.001	<.001	<.001					
(7)	.50	.42	.53	.38	.64	.53	3.45				
	[1.13]	[.23]	[.09]	[.08]	[.05]	[.05]	[.60]				
	.66	.06	<.001	<.001	<.001	<.001	.79				
(8)	.44	.48	.61	.72	.71	.75	.61	2.67			
	[1.87]	[.37]	[.12]	[.07]	[.06]	[.05]	[.07]	[.59]			
	.81	.19	<.001	<.001	<.001	<.001	<.001	.00			
(9)	.57	.62	.72	.65	.74	.75	.59	.57	3.04		
	[1.43]	[.29]	[.08]	[.07]	[.04]	[.04]	[.06]	[.07]	[.55]		
	.69	.03	<.001	<.001	<.001	<.001	<.001	<.001	<.001		
(10)	.72	.81	.90	.81	.88	.88	.55	.71	.81	3.13	
	[1.42]	[.24]	[.05]	[.05]	[.02]	[.02]	[.06]	[.06]	[.04]	[.51]	
	.61	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
(11)	.74	.74	.80	.70	.83	.75	.51	.54	.71	.74	3.21
	[2.04]	[.31]	[.13]	[.11]	[.09]	[.12]	[.11]	[.12]	[.09]	[.10]	[1.75]
	.72	.02	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	.22

Notes: Each cell contains an estimate, followed by the standard error in brackets and the p-value. The diagonals represent the standard deviation (e.g., the first diagonal represents the standard deviation for pre bottle bill price, which is .22 with a standard error of [.02] and a p-value of <.001). The off-diagonals represent the correlation between the household-specific parameters (e.g., the pre bottle bill and post bottle bill price household-level parameters are correlated with .93 (standard error of [.91] and a p-value smaller than <.001), suggesting that households with a higher price sensitivity before the bottle bill also have a higher price sensitivity post bottle bill). The correlations are bivariate and hence symmetric, so we only display the lower triangular.

Table W30. Elasticities at Median Pre-Bottle Bill Prices

Package size (in fl. oz.)	ϵ_s^{pre}	ϵ_s^{post}	$\left(\epsilon_s^{post} - \epsilon_s^{pre}\right)$
8	-.753 [-.788, -.713]	-.313 [-.386, -.241]	.439 [.354, .521]
11	-.740 [-.778, -.700]	-.277 [-.363, -.177]	.463 [.360, .569]
16.9	-.730 [-.765, -.691]	-.299 [-.366, -.230]	.431 [.351, .503]
20	-.712 [-.746, -.675]	-.318 [-.383, -.252]	.394 [.318, .464]
23.7	-.762 [-.797, -.720]	-.266 [-.343, -.187]	.496 [.407, .574]
33.8	-.729 [-.764, -.689]	-.215 [-.283, -.145]	.513 [.436, .586]
101.4	-.739 [-.774, -.698]	-.208 [-.284, -.142]	.531 [.442, .603]
128	-.735 [-.770, -.695]	-.356 [-.429, -.285]	.379 [.297, .455]
320	-.727 [-.765, -.687]	-.289 [-.369, -.216]	.438 [.351, .515]
Covered (<128)	-.726 [-.760, -.688]	-.297 [-.365, -.228]	.428 [.350, .501]
Non-covered (>=128)	-.733 [-.769, -.694]	-.346 [-.417, -.274]	.388 [.311, .466]

Notes: Each cell presents the elasticity calculated at the posterior mean per household, with a 95% confidence interval based on 500 parameter draws in brackets.

Web Appendix N: Parameter Estimates Additional Retailer Effort

Table W31. Parameter Estimates Additional Retailer Effort (Equation 5, Price Change)

	OLS		Weighted-Least Squares	
Dependent Variable = Price Change	# of unique UPCs	Ratio of Water and Soda Sales	# of unique UPCs	Ratio of Water and Soda Sales
Covariates	N = 99	N = 99	N = 99	N = 99
	Est.	Est.	Est.	Est.
Covered (vs. Non-Covered) Package Size	.188	.192	.241	.203
	(.028)	(.031)	(.016)	(.034)
	[<.001]	[<.001]	[<.001]	[<.001]
# of unique UPCs	<.001		<.001	
	(.001)		(<.001)	
	[.734]		[.194]	
Covered x # of unique UPCs	.012		.013	
	(.003)		(.002)	
	[<.001]		[<.001]	
Ratio of Water and Soda Sales		-.015		.007
		(.011)		(.002)
		[.179]		[.001]
Covered x Ratio of Water and Soda Sales		.281		.196
		(.097)		(.058)
		[.005]		[.001]
Intercept	.005	.005	<.001	-.001
	(.004)	(.004)	(.001)	(.001)
	[.175]	[.148]	[.813]	[.410]

Notes: Values in parentheses are heteroskedasticity-robust standard errors, values in brackets p-values.

Table W32. Parameter Estimates: Additional Retail Effort (Equation 5, Sales Change)

	OLS		Weighted-Least Squares	
Dependent Variable = Sales Change	# of unique UPCs	Ratio of Water and Soda Sales	# of unique UPCs	Ratio of Water and Soda Sales
Covariates	N = 99	N = 99	N = 99	N = 99
	Est.	Est.	Est.	Est.
Covered (vs. Non-Covered) Package Size	-1,358.520	-1,318.865	73.087	329.469
	(663.882)	(669.458)	(329.117)	(307.227)
	[.043]	[.052]	[.825]	[.286]
# of unique UPCs	37.591		57.675	
	(39.067)		(15.675)	
	[.338]		[<.001]	
Covered x # of unique UPCs	-65.814		-31.602	
	(46.889)		(26.404)	
	[.164]		[.234]	
Ratio of Water and Soda Sales		1,609.184		611.950
		(1,031.294)		(453.971)
		[.122]		[.181]
Covered x Ratio of Water and Soda Sales		-2,024.897		588.699
		(1,524.631)		(856.486)
		[.187]		[.494]
Intercept	1,088.202	1,039.918	447.641	223.746
	(452.289)	(449.212)	(106.803)	(100.030)
	[.018]	[.023]	[<.001]	[.028]

Notes: Values in parentheses are heteroskedasticity-robust standard errors, values in brackets p-values.

Web Appendix O: Estimates for Connecticut

Table W33. Information on Number of Treated and Control Cases by Package Size for Connecticut

Package Size (fl. oz.)	Covered by Bottle Bill	# of UPCs	UPC–Store Pairs		Multipack types
			Treated	Control	
8	✓	4	163	141	8 (16%), 12 (40%), 24 (45%)
11	✓	1	54	153	8 (100%)
16.9	✓	28	1,123	29,730	1 (.5%), 6 (3%), 12 (5%), 15 (4%), 24 (87%)
20	✓	13	627	22,300	1 (1%), 4 (.8%), 6 (1%), 24 (96%)
23.7	✓	3	218	979	1 (6%), 6 (48%), 12 (46%)
33.8	✓	12	805	26,651	1 (38%), 6 (62%)
101.4	×	2	248	972	1 (100%)
128	×	16	579	19,127	1 (7%), 3 (4%), 6 (89%)
320	×	8	127	1,634	1 (16%), 2 (84%)
Total		87	3,944	101,687	

Table W34. Changes in Sales and Prices Before and After Bottle Bill by Package Size in Connecticut

Panel A: Treated UPC-Store Pairs

Package Size (fl. oz.)	Volume Sales in fl. oz.			Price per fl. oz.			Unit Price
	Before	After	Change	Before	After	Change	Change in ¢
8	3,067	3,542	15.48%	3.315	3.199	-3.48%	-.923
11	2,316	1,567	-32.34%	2.996	3.091	3.17%	1.044
16.9	14,141	12,965	-8.32%	3.104	3.181	2.48%	1.302
20	907	979	8.04%	6.709	6.878	2.52%	3.376
23.7	1,460	1,385	-5.13%	3.682	3.928	6.69%	5.842
33.8	439	391	-10.93%	4.743	4.933	4.00%	6.416
101.4	3,578	4,479	25.17%	1.458	1.465	.50%	.735
128	7,375	8,286	12.35%	.962	.969	.71%	.878
320	9,441	10,371	9.85%	.923	.843	-8.72%	-25.757

Notes: Volume sales and price are averages per week by UPC–store pair. Unit price refers to the price per bottle.

Panel B: Control UPC-Store Pairs

Package Size (fl. oz.)	Volume Sales in fl. oz.			Price per fl. oz.			Unit Price
	Before	After	Change	Before	After	Change	Change in ¢
8	2,446	2,737	11.90%	3.403	3.158	-7.21%	-1.962
11	678	948	39.92%	3.231	2.697	-16.53%	-5.875
16.9	4,336	4,445	2.50%	3.041	3.042	0.02%	.012
20	520	513	-1.33%	6.485	6.563	1.21%	1.566
23.7	467	390	-16.55%	4.263	4.662	9.37%	9.466
33.8	434	400	-7.77%	4.749	4.820	1.49%	2.395
101.4	1,482	1,510	1.87%	1.408	1.410	.19%	.272
128	1,841	1,843	.10%	.958	1.004	4.85%	5.950
320	1,868	1,977	5.83%	.987	1.006	1.91%	6.026

Notes: Volume sales and price are averages per week by UPC–store pair. Unit price refers to the price per bottle.

Table W35. Connecticut: Effect of Bottle Bills on Volume Sales and Retail Prices by UPC

Package Size in fl. oz.	Multipack	UPC ID	Treated Cases	Volume Sales			Price		
				Est. ($\hat{\tau}_u^S$)	SE	p-val.	Est. ($\hat{\tau}_u^P$)	SE	p-val.
8	8	1	44	29.21	40.72	.473	.569	.012	<.001
	12	2	43	-397.41	175.51	.024	.381	.010	<.001
		3	41	149.56	66.56	.025	-.005	.007	.507
	24	4	35	197.00	251.76	.434	.009	.001	<.001
11	8	5	54	-518.34	99.57	<.001	.385	.033	<.001
16.9	1	6	46	-42.51	16.27	.009	.204	.017	<.001
		7	1	1,199.82	841.88	.154	.039	.146	.791
		8	15	1.91	4.89	.696	.107	.047	.024
		9	93	-2.23	3.33	.503	.636	.028	<.001
		10	24	14.89	16.83	.377	.172	.080	.031
		11	39	-4.78	4.37	.274	-.015	.031	.622
		12	1	38.19	146.12	.794	-.029	.290	.919
	6	13	1	22.11	86.93	.799	.064	.078	.411
		14	4	44.68	36.61	.222	-.023	.006	<.001
		15	11	33.24	54.21	.540	.232	.054	<.001
		16	97	-266.79	61.84	<.001	.181	.020	<.001
		17	26	103.02	32.60	.002	.029	.021	.181
		18	63	-17.42	24.65	.480	.296	.034	<.001
		19	40	500.08	84.64	<.001	-.071	.026	.007
	12	20	28	-120.89	42.49	.004	-.003	.002	.070
		21	35	-59.11	53.46	.269	-.003	.003	.308
		22	43	-112.88	93.41	.227	.249	.010	<.001
		23	36	333.99	65.70	<.001	-.004	.004	.331
	15	24	22	73.74	61.33	.229	.032	.013	.012
		25	37	279.55	84.67	.001	-.026	.012	.026
	24	26	108	-3,261.71	668.59	<.001	.161	.013	<.001
		27	64	-3,267.70	279.08	<.001	.230	.005	<.001
		28	11	430.88	852.85	.613	.097	.020	<.001
		29	47	-1,226.29	727.73	.092	.067	.011	<.001
		30	75	-41,223.55	7,260.71	<.001	.154	.007	<.001
		31	50	912.00	162.49	<.001	.009	.003	.002
		32	63	408.01	184.62	.027	.012	.006	.058
		33	43	15,573.75	1,983.72	<.001	.010	.004	.016
20	1	34	241	29.69	9.81	.002	.142	.019	<.001
		35	261	-3.78	8.06	.639	.108	.036	.003
		36	1	-123.02	20.89	<.001	-.008	<.001	<.001
		37	6	-.45	14.01	.974	.035	.032	.265
		38	4	32.61	23.92	.173	.011	.016	.492
		39	1	16.21	3.73	<.001	-.587	.086	<.001
		40	42	284.50	39.33	<.001	-.001	.012	.965
	4	41	12	-42.08	25.39	.097	-.002	.008	.829
		42	8	26.25	18.86	.164	-.015	.009	.113
		43	9	-15.85	35.59	.656	.014	.025	.578
		44	6	-26.29	24.18	.277	-.017	.011	.105
	6	45	25	-95.55	58.82	.104	.121	.035	.001
	24	46	11	2,363.83	1,380.19	.087	.004	.026	.864
23.7	1	47	129	81.64	17.09	<.001	.059	.019	.002
	6	48	46	3.91	187.13	.983	.161	.009	<.001
	12	49	43	-235.48	97.78	.016	.208	.008	<.001
33.8	1	50	107	-22.06	11.26	.050	.165	.021	<.001
		51	56	7.70	21.44	.719	.212	.006	<.001
		52	125	-12.35	8.63	.152	.023	.023	.329
		53	1	-324.04	543.76	.551	-.009	.025	.732
		54	98	109.79	28.17	<.001	-.135	.037	<.001
		55	65	-25.39	8.62	.003	.051	.043	.236
		56	126	-46.41	14.60	.001	.353	.024	<.001
		57	100	-90.71	36.99	.014	-.248	.041	<.001
		58	20	33.41	12.47	.007	-.017	.034	.612
		59	51	48.66	14.97	.001	-.020	.019	.278
	6	60	33	9.90	38.42	.797	.111	.029	<.001
		61	23	-14.90	44.91	.740	.129	.032	<.001
101.4	1	62	206	580.18	135.06	<.001	-.013	.004	.001
		63	42	1,399.52	174.67	<.001	-.006	.001	<.001
128	1	64	1	81.87	136.94	.550	<.001	.018	.986
		65	20	-18.13	45.09	.688	-.045	.014	.002
		66	2	40.16	601.49	.947	-.001	.001	.133

Package Size in fl. oz.	Multipack	UPC ID	Treated Cases	Volume Sales			Price		
				Est. ($\hat{\tau}_u^S$)	SE	p-val.	Est. ($\hat{\tau}_u^P$)	SE	p-val.
		67	100	124.52	44.37	.005	-.021	.007	.003
		68	55	97.88	65.10	.133	<.001	<.001	.949
		69	46	2,119.06	688.16	.002	<.001	<.001	.404
		70	44	581.44	215.33	.007	<.001	<.001	.176
		71	43	31.17	32.50	.338	.003	.007	.723
		72	57	27.08	51.65	.600	.022	.003	<.001
		73	1	-2,135.53	507.69	<.001	.009	.007	.191
		74	136	47.38	47.71	.321	.006	.004	.088
		75	15	901.00	228.02	<.001	-.001	.001	.161
		76	43	3,265.33	643.17	<.001	<.001	<.001	.770
	3	77	3	290.35	393.39	.461	<.001	<.001	<.001
		78	2	-2,331.07	2,336.09	.318	-.001	.001	.533
	6	79	11	272.81	3,781.13	.942	-.011	.005	.022
320	1	80	2	-874.96	255.82	.001	<.001	<.001	<.001
		81	14	106.77	152.71	.484	-.005	.006	.453
		82	58	952.08	248.63	<.001	.004	.002	.032
		83	7	17.14	83.68	.838	<.001	.002	.985
		84	31	830.85	269.98	.002	<.001	<.001	.764
		85	2	-490.17	1,075.88	.649	-.017	.001	<.001
		86	2	-480.55	885.58	.587	-.076	<.001	<.001
	2	87	11	189.23	1,720.04	.912	-.001	.001	.302

Notes: Jackknife-based standard errors are presented. Treated cases is the number of treated units. In case of one treated case, placebo-based standard errors are presented.

Table W36. Connecticut: Effect of Bottle Bills Aggregated to Package Size Level

Package Size in fl. oz.	# of UPCs	Treated Cases	Volume Sales			Price		
			Est.	SE	p-value	Est.	SE	p-value
8	4	163	-17.03	128.09	.894	.255	.008	<.001
11	1	54	-518.34	99.57	<.001	.385	.033	<.001
16.9	28	1,123	-2,632.11	723.51	<.001	.151	.017	<.001
20	13	627	65.64	38.11	.085	.104	.026	<.001
23.7	3	218	2.69	68.89	.969	.110	.015	<.001
33.8	12	805	-8.04	20.12	.689	.059	.028	.034
101.4	2	248	718.94	141.77	<.001	-.012	.003	<.001
128	16	579	519.90	243.95	.033	-.002	.004	.672
320	8	127	637.65	384.79	.097	<.001	.002	.883

Notes: Estimates and standard errors are the weighted mean (using the number of treated cases as weight) across the UPC-level values, presented in Table W35. "# of UPCs" reflects the number of UPCs belonging to a package size.

References not used in main text

Guyt, Jonne Y. and Els Gijsbrechts (2014), "Take turns or march in sync? The impact of the national brand promotion calendar on manufacturer and retailer performance," *Journal of Marketing Research*, 51 (6), 753-72.

Manski, Charles F. and Daniel McFadden (1981), "Alternative estimators and sample designs for discrete choice analysis," in Structural Analysis of Discrete Data with Econometric Applications, Ed. Charles F. Manski and Daniel McFadden, 2-50. Cambridge, MA: MIT Press.

Train, Kenneth E. (2009), "Discrete choice methods with simulation," Cambridge University Press.