Online Appendix for "Salience and Taxation with Imperfect Competition"

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1 Proofs

Proof. Proposition 1. Let

$$W(p(t),t,J(t)) = \underbrace{u(Q_L(t),J(t)) - (p(t)+t)Q}_{CS} + \underbrace{p(t)Q_L(t) - Jc\left(\frac{Q_L(t)}{J(t)}\right) - J(t)F}_{J\pi} + \underbrace{tQ_L(t)}_{R}$$

By totally differentiating $W_L(t) = W(p(t),t,J(t))$ we obtain:

$$\begin{aligned}\frac{dW_L}{dt} = & \left(\frac{\partial u}{\partial Q}(Q_0,J_0) - c'(q_0)\right)\frac{dQ_L}{dt} + \left(\frac{\partial u}{\partial J}(Q_0,J_0) - c(q_0) - F + q_0c'(q_0)\right)\frac{dJ}{dt} \\ & = (p_0 + \theta t_0 - c'(q_0))\frac{dQ_L}{dt} + (\Lambda_0 + \pi_0 - [p_0 - c'(q_0)] * q_0)\frac{dJ}{dt}\end{aligned}$$

where we used the first order approximation from Chetty, Looney, Kroft (2009) $\frac{\partial u}{\partial J}(Q_0,J_0) = p_0 + \theta t_0$, we used our definition of variety effect $\Lambda_0 = \frac{\partial u}{\partial J}(Q_0,J_0)$ and profits $\pi_0 = p_0q_0 - c(q_0) - F$. □

Proof. Proposition 3. The proof consists of the following steps, which are depicted in Figure 1 and Figure 2 for the case of a nonzero initial tax. First, the variety effect is equal to $\Lambda = (P^* - P_1^*)Q_0$. Thus, solving for the variety effect requires solving for P^* and P_1^*. P^* is the point on the initial price-demand curve corresponding to the final output level Q_1. It can be obtained as $P^* = P_0 + \theta(P^{**} - P_0)$. Next, P_1^* is the point on the final price-demand curve at the final level of output. It may be obtained as $P_1^* = P_1 + \theta t_1$, where P_1 is price level at which the final tax-demand curve and final price-demand curve intersect. Therefore,

letting the change in producer prices as a result of the tax be given by $dP = P_1 - P_0$ and $dQ = Q_1 - Q_0$, we get:

$$\begin{aligned} P^* - P_1^* &= P_0 - P_1 + \theta(P^{**} - P_0) - \theta t_1 \\ &= -dP + \theta \left(\left(\frac{\partial Q}{\partial t} \right)^{-1} (Q_1 - Q^*) - t_1 \right) \\ &= -dP + \theta \left(\left(\frac{\partial Q}{\partial t} \right)^{-1} (Q_1 - Q_0) + t_0 - t_1 \right) \\ &= -dP + \theta \left(\left(\frac{\partial Q}{\partial t} \right)^{-1} dQ - dt \right) \end{aligned}$$

where Q^* is the level of output when there are no taxes in the market and using the fact that to first-order, $Q^* = Q_0 - t_0 \frac{\partial Q}{\partial t}$. □

2 Ad valorem taxes

Because our empirical application is in terms of ad valorem taxes instead of unit taxes, in this section we derive the analogous propositions for ad valorem taxes. In particular, it is of interest to derive the analogous of equations (10) and (12) which correspond to equations (A2) and (A4). The proofs are not included because they are completely analogous to those of unit taxes.

In the case of ad valorem taxes we may define welfare as

$$W(p,t,J) = \underbrace{u(Q,J) - p(1+\tau)Q}_{CS} + \underbrace{pQ - Jc\left(\frac{Q}{J}\right) - JF}_{J\pi} + \underbrace{\tau pQ}_{R}$$

Define $\tilde{\theta} = \frac{\frac{\partial \log(Q)}{\partial \log(1+\tau)}}{\frac{\partial \log(Q)}{\partial \log(p)}}$, then:

Proposition 1'. *Consider a change in the tax from τ_0 to τ_1. Under Assumptions 1 and 2, a first-order approximation to the marginal excess burden of taxation is:*

$$\frac{dW}{d\tau} = \underbrace{(p_0(1+\tilde{\theta}\tau_0) - c'(q_0))\frac{dQ_L}{d\tau}}_{\text{Quantity effect}} + \underbrace{(\Lambda_0 + \pi_0 - [p_0 - c'(q_0)] * q_0)\frac{dJ}{d\tau}}_{\text{Diversity effect}} \tag{A1}$$

Proposition 3'. *Under Assumptions 1 and 2 and Lemma 1, the marginal excess burden of taxation is given by:*

$$\frac{dW}{d\tau} = \Lambda_0 \frac{dJ}{d\tau} - Q_0 \frac{dp}{d\tau} + \tilde{\theta}\tau_0 p_0 \frac{dQ_L}{d\tau} \tag{A2}$$

Taking logs and rescaling by $\frac{W}{pQ}$ we may obtain:[1]

$$\frac{dlog(W)}{dlog(1+\tau)}\frac{W}{pQ} = \tilde{\Lambda}_0 \frac{dlog(J)}{dlog(1+\tau)} - \frac{dlog(p)}{dlog(1+\tau)} + \tilde{\theta}\tau_0 \frac{dlog(Q_L)}{dlog(1+\tau)} \tag{A3}$$

Proposition 4'. *Under Assumptions 1, 2 and 3, the variety effect is identified:*

$$\Lambda \frac{dJ}{d\tau} = -Q\left((1+\tilde{\theta}\tau)\frac{dp}{d\tau} + \tilde{\theta}p\left(1 - \frac{\frac{dQ_L}{d\tau}}{\frac{\partial Q}{\partial \tau}}\right)\right) \tag{A4}$$

[1] For comparison, when all terms in equation (10) are scaled by J/pQ, we obtain

$$\frac{d\log W}{d\log(1+t)}\frac{W}{p_0 Q_0} = \frac{\Lambda_0}{p_0 q_0}\frac{d\log(J)}{d\log(1+t)} - \frac{d\log(p)}{d\log(1+t)} + \frac{t}{1+t}\frac{\frac{\partial \log(Q)}{\partial \log(1+t)}}{\frac{\partial \log(Q)}{\partial \log(p)}}\frac{d\log(Q_L)}{d\log(1+t)}$$

Finally, rescaling by $\frac{J}{pQ}$ we may obtain:[2]

$$\tilde{\Lambda} = \frac{J}{pQ}\Lambda \tag{A5}$$

$$= \left[\left(1+\tau\frac{\frac{\partial \log(Q)}{\partial \log(1+\tau)}}{\frac{\partial \log(Q)}{\partial \log(p)}}\right)\frac{d\log(p)}{d\log(1+\tau)} + (1+\tau)\frac{\frac{\partial \log(Q)}{\partial \log(1+\tau)}}{\frac{\partial \log(Q)}{\partial \log(p)}}\left(1-\frac{\frac{d\log Q}{d\log(1+\tau)}}{\frac{d\log Q}{d\log(1+\tau)}\Big|_{J,p}}\right)\right]\frac{1}{\frac{d\log(J)}{d\log(1+\tau)}} \tag{A6}$$

[2]For comparison, when all terms in equation (12) are scaled by J/pQ, we obtain

$$\frac{J}{pQ}\Lambda = \left[\frac{d\log p}{d\log(1+t)} + \frac{\frac{\partial \log(Q)}{\partial \log(1+t)}}{\frac{\partial \log(Q)}{\partial \log(p)}}\left(1-\frac{\frac{d\log Q}{d\log(1+t)}}{\frac{\partial \log Q}{\partial \log(1+t)}}\right)\right]\frac{1}{\frac{d\log J}{d\log(1+t)}}.$$

3 Data Appendix

3.1 Nielsen Retail Scanner Data

We obtained the Nielsen scanner data from the Kilts Marketing Data Center at the University of Chicago Booth School of Business. The micro data records weekly prices and quantities by product at the barcode level (Universal Product Code, UPC) for over 35,000 stores from approximately 90 retail chains across the United States (except for Hawaii and Alaska), covering the years 2006-2014.[3] Each store, geolocated at the county level, is assigned one of five possible store types ("channels"), and can be matched with its parent chain.[4] Products are organized in a hierarchical structure: There are over 2.5 million different UPCs, which are categorized into approximately 1,200 *product-module*s. Each module is then assigned to one of roughly 120 *product-groups*, which in turn is part of one of 10 broader *product-departments*. Table A1 shows a few examples of UPCs included in the retail data.

The Retail Scanner dataset's coverage of total U.S. sales volume varies across locations and store-types. For instance, it covers more than half of the total sales volume of U.S. grocery stores, but only 2 percent of sales in convenience stores. Also, the distribution of stores by store-type varies substantially across locations. Therefore, to address any potential bias caused by differential coverage of sales by type of products across counties, we collapse the data at the store-level rather than at the county-level and exploit within-store variation in our analyses. We further impose several sample restrictions. First, we restrict our sample of stores to grocery stores. This restriction is necessary to ensure that compositional differences across regions are not driving our results based on sales tax variation. Also, the number of drugstore and mass merchanside chains is very small. Second, we only keep modules sold in all 48 continental states. In our main specification, we restrict the sample to the top selling modules that rank above the 80th percentile of total U.S. sales in the distributions of food and non-food modules. These 198 modules account for almost 80% of the total value of sales in grocery stores in the scanner data.

From the scanner data, we construct two samples that we use for our empirical analysis: 1) repeated cross-sections where the unit of observation is at the store-module-year level, 2) panel data where the unit of observation is at the store-module-quarter level. For each sample,

[3]Products without a barcode such as random weight meat, fruits, and vegetables are not included in the data set.

[4]The five channels are grocery, drug, mass merchandise, convenience and liquor stores. Each store and each parent chain has a unique identifier. Retail chain names are confidential and unknown to researchers.

we generate measures of price (p), quantity (Q) and product variety (J) at the module level. These variables are defined as in Kroft et al. (2019), but we normalize their value within store-time cells in our sales tax application. Most of the time-variation in effective tax rates occurs via changes in sales tax rates, which affect most modules within a store concomitantly, rather than changes in module-specific exemptions. Also, most rate changes occur either on January 1 or July 1. Hence, the simultaneous inclusion of store-by-time and module-by-time fixed effects in our time-series econometric specification would leave little residual tax variation to identify our short-run elasticities. We therefore normalize the variables within store-time cells instead and omit store-by-time fixed effects from our models.

Prices We measure consumer price for each module-store-period combination by $\tilde{p}_{mrcst} = p_{mrcst}(1 + \tau_{mcs})$ where p_{mrcst} is pre-tax price and m = module, r = store, t = time, c = county and s = state.[5] We normalize these consumer price indices within store-time cells by dividing by the store-time-specific average *pre-tax* price.[6] We normalize using pre-tax prices rather than consumer prices so that the *mechanical* relationship between the log price measure and log sales taxes is effectively one-to-one. To see this, note that $\log(\tilde{p}_{mrcst}/\bar{p}_{rcst}) = (\log p_{mrcst} - \log \bar{p}_{rcst}) + \log(1 + \tau_{mcs})$.

Quantity To measure output Q_{mrcst}, we aggregate expected revenue $Q_{jmrcst} = q_{jmrcst} \times \bar{p}_{jt}$ across all UPCs to the module-store-year level for the cross-sectional analysis and to the module-store-quarter level for the time-series analysis, where q_{jmrcst} is the quantity of product (UPC) j sold in store r at time t and $\bar{p}_{jt}$ is the national average price of that product at that time.We then obtain a normalized metric comparable to the one generated for consumer prices by calculating output *shares* within each store-time cells: $E_{mrcst} = Q_{mrcst}/Q_{rcst}$ for each period, where $Q_{rcst} = \sum_m Q_{mrcst}$.

Variety Finally, variety is measured by counting the number of unique UPCs per module sold each period t in store r: $J_{mrt} = \{j \in J_m | q_{jmrt} > 0\}$. As for other variables, we normalize variety by dividing by the store-time average.

[5]Module-store-time pre-tax prices p_{mrcst} are store-time fixed effects from a module-specific regression of log prices on UPC fixed effects and store-time fixed effects. See Kroft et al. (2019) for details.

[6]The within store-time average is $\bar{p}_{rcst} = \frac{1}{N_{rcst}} \sum_m \exp(p_{mrcst})$, where N_{rcst} is the number of modules with positive sales in store r at time t.

3.2 U.S. Sales Tax Exemptions and Rates

The second source of data we use is a hand-collected monthly panel of local (county and state) sales tax *rates* and state-level *exemptions*, which vary at the product-module level, covering the years 2006-2015.[7] All sources used to input the exemption status of products are listed in Table A9. In general, exemptions are set by states and are module-specific.[8] The general rule of thumb is that food products are tax-exempt and non-food products are taxable. However, there are important exceptions to this rule. First, several states tax food at the full rate or a reduced rate. Second, in a few states, food products are exempt from the state-level portion of the total sales tax rate, but remain subject to the county-level sales tax. Third, in some cases where food is tax-exempt, there is a tax that applies at the product-module level. For example, prepared foods are subject to sales taxes in many states. Finally, some states exempt some non-food products from sales taxes. Our final exemption sample is at the county-module-month level, however it should be noted that changes in exemptions over time are very rare during our sample period. For tax rates, we collected monthly state-level and county-level rates.[9]

There are several possible sources of measurement error in our sales tax rates. First, we do not incorporate county-level exemptions or county-specific sales surtaxes that apply to specific products or modules, although our understanding is that these cases are uncommon. Second, there may be measurement error coming from our exemption definitions and how we assigned a taxability status to each module, which in some cases required a subjective judgment based on interpreting the text of the state sales tax law. While the bulk of the variation in taxes occurs at the module level or higher, there are some instances where taxability varies within module. For example, in New York, fruit drinks are tax exempt as long as they contain at least 70% real fruit juice, but are subject to the sales tax otherwise. Therefore, some products in Nielsen's module "Fruit Juice- Apple", may or may not be taxed in New York, but all are considered eligible for the sales tax exemption in our database since we cannot readily identify the real fruit juice content.[10]

[7] We use sales tax rates from 2015 to test whether there is an anticipation response to changes in sales tax rates and do not find any evidence that there is. Results are available upon request.

[8] There are a handful of exceptions to this. Colorado, for example, allows each county to decide whether to subject food to the county-level portion of the sales tax rate.

[9] Some cities and other localities also impose an additional local sales tax rate. We do not incorporate rates that apply to areas smaller than counties.

[10] In cases where it is impossible to tell whether the majority of products in a given module are subject to the tax or not, we code the statutory tax rate as missing. This results in excluding less than 3% of the observations in our sample.

As a final step, we merge the effective sales tax rates to the Nielsen scanner data. This requires aggregating the sales tax data to the level of the scanner data. For the cross-sectional analysis, we obtain yearly sales tax rates by relying on the effective rate on September 1 of a given year. For the time-series analysis, we use the rate effective at the mid-point of each quarter (February for quarter 1, May for quarter 2, etc). We then merge the sales tax rates to the scanner data by product-module, county and time. Our final cross-sectional and panel samples cover over 10,000 grocery stores, and contain price, output and variety for 198 modules in 1,625 counties.[11]

3.3 Descriptive Statistics

Figure A1 shows the cross-sectional distribution of the total sales tax rate (state + county) in September 2008. There is substantial cross-sectional variation in sales tax rates ranging from zero in Montana, Oregon, New Hampshire and Delaware to a maximum rate of 9.75 percent in Tennessee. Table A3 compares the observable characteristics of low and high tax states. It presents annual descriptive statistics for the year 2008 for simplicity as the patterns are very similar in the other years of our sample. Column (1) reports means and standard deviations for all counties and columns (2) and (3) report results for high and low sales tax counties, respectively. The typical county in our sample has roughly $75 million (U.S. dollars) in yearly grocery store sales (for the top 20 percent selling modules) with about 6.5 stores per county. Food modules account for roughly 75 percent of total annual sales on average. There are roughly 100 varieties sold in a typical module in a typical grocery store over a year. Turning to taxes, the average combined county and state sales tax rate is 6.3 percent while the average tax rate on food products alone is 1.6 percent. Finally, the typical county has a population of about 165,000, a household median income of $44,000 and roughly 50 percent with a high school degree or less.

Turning to columns (2) and (3), we see that grocery stores are very similar between high-sales tax and low-sales tax counties on a number of dimensions although low-tax counties have larger sales per store ($10 million versus $9.3 million). Locations with sales tax rates above the median exhibit lower rates of excise taxes on alcohol and cigarettes, tend to be more populous, have more grocery stores, and cover smaller territories. In column (4), we regress the county characteristics on the sales tax rate. The reported coefficients indicate that sales

[11]The panel includes stores in 1,625 counties, but the number of stores and counties varies slightly across years.

tax rates are negatively associated with variety and price levels, but positively correlated with the food share of sales. These regressions also provide further evidence that counties with high sales tax rate have, on average, lower rates for other types of taxes.

In Figure A2, we present visual evidence on the distribution of food tax exemptions across states. In general we see that food taxability status is spatially correlated. For example, most states that tax food are located in the South or in the Midwest. In regressions below, we evaluate the robustness of our results to controlling for module fixed effects interacted with census region fixed effects.

3.4 Robustness

Robustness Tests: Long-Run

We explore a series of robustness checks in Table A5. Columns (1) and (2) report our benchmark results from Table 2 for comparison. First, to address spatial correlation of taxes, we turn to a specification that relies exclusively on module-specific exemptions. More precisely, we exclude all observations included in the difference-in-differences model. This sample thus includes: (a) all observations in counties where food is subject to a sales tax, as well as (b) for counties where food is generally exempt, the subset of modules for which there is some between-state variation in taxability status. The results, shown in columns (3) and (4) of Table A5, are in line with the baseline estimates. Second, we examine the robustness of our results to dropping small counties (with a population below $150,000$), for which few stores are observed and are therefore more likely to be subject to sampling issues. These are reported in columns (5) and (6) and again we find that our results are qualitatively similar. Third, to verify that the estimated effects are not driven by *counties* setting their local sales tax rates endogenously with respect to local consumer preferences, we instrument the county-level effective sales tax rate with the state-level effective rate (columns (7) and (8)) and again find similar results. Finally, in column (9), we include all Nielsen's modules that are observed in all of the 48 continental states. Our estimates are consistent across all these specifications.

Our estimates indicate that variety, measured as the number of products with positive sales, adjusts to changes in sales tax rates in the long-run. This approach implicitly puts an equal weight on all products that are marginally added or withdrawn from stores as a result of sales taxes. To explore which types of products are driving the effect on variety, we construct a new measure that puts relatively more weight on popular products – those with

high national market shares – relative to low-share UPCs. We call this variable *variety shares* (G) and calculate it as follows. First, we obtain each UPC's market share by dividing total national sales of each product by the total national sales of the module it belongs to.[12] Then, for each store-module cell, variety shares are obtained by adding up the UPC-level market shares. For instance, a store that has positive sales of nearly all products that appear in the data set would have a variety share close to 1. Differences in G across stores therefore reflect both differences in the number of products (J) as well as in the market shares of products with positive sales. The empirical relationship between G and J is positive and concave, where stores with few different products tend to mainly sell high market-share products. Intuitively, if the variety effect operates mainly through low-share products, the tax elasticity of variety shares (G) should be smaller than the elasticity of variety counts (J). Estimates of these elasticities are shown in Table A3. In columns (1) and (2) we report our benchmark results for variety counts, and columns (3) and (4) show the corresponding results for variety shares. The estimates for the main specification with store and module fixed effects indicate a variety share elasticity of -0.474 (s.e. 0.152), about half the size of the variety count elasticity. The gap between the two coefficients shrinks when module effects are region-specific, but the pattern is qualitatively similar. In columns (5) through (8), we conduct a border-design analysis for both measures of variety. In columns (6) and (8) module fixed effects are allowed to vary by county pairs. Again, the variety count elasticity of -0.317 (s.e. 0.073) exceeds the variety share elasticity of -0.209 (s.e. 0.065). Overall, these results suggest that the variety response is mainly driven by entry and exit of low-market share products.

Robustness Tests: Short-Run

In Table A6 we explore the sensitivity of our short-run estimates to alternative samples and specifications. Columns (1) and (2) show our baseline estimates from Table 3 for comparison. In column (3), we include store-by-time fixed effects to flexibly account for any location-specific time trends. In columns (4) to (6), we restrict our sample to large counties and obtain very similar results for all three dependent variables.

[12] In practice, we calculate these shares separately for each UPC-store cell leaving out the store's sales from national sales, so that the market shares are store-specific. However, since every store only makes up a very small portion of total national shares, leaving out own-store sales only trivially affect the resulting measures.

Table A1 : Examples of Universal Product Codes (UPC)

UPC Description	Module Description	Group Description	Department Description	Brand Description	Multi	Size	Units
M&M PLN DK CH HDY-M HDY	CANDY-CHOCOLATE-SPECIAL	CANDY	DRY GROCERY	M&M MARS M&M PLAIN	1	12.6	OZ
M&M PLN CH/TY SHREK 2 HL	CANDY-CHOCOLATE-SPECIAL	CANDY	DRY GROCERY	M&M MARS M&M PLAIN	1	1.75	OZ
M&M PLN CH DSP STAR WARS	CANDY-CHOCOLATE-SPECIAL	CANDY	DRY GROCERY	M&M MARS M&M PLAIN	1	1.06	OZ
R SSY E-C MSE AP CHFN	COSMETICS-EYE SHADOWS	COSMETICS	HEALTH & BEAUTY CARE	REVLON STAR STYLE	1	0.17	OZ
R SSY E-S PWD SQN	COSMETICS-EYE SHADOWS	COSMETICS	HEALTH & BEAUTY CARE	REVLON STAR STYLE	1	0.05	OZ
AXE AR R TWIST	DEODORANTS - COLOGNE TYPE	DEODORANT	HEALTH & BEAUTY CARE	AXE	1	4	OZ
CTL BR EGGS A LG	EGGS-FRESH	EGGS	DAIRY	CTL BR	1	12	CT
CTL BR B-E JMB	EGGS-FRESH	EGGS	DAIRY	CTL BR	1	12	CT
COKE CLS R CL NB 6P	SOFT DRINKS - CARBONATED	CARBONATED BEVERAGES	DRY GROCERY	COCA-COLA CLASSIC R	6	8	OZ
COKE CLS R CL CN &	SOFT DRINKS - CARBONATED	CARBONATED BEVERAGES	DRY GROCERY	COCA-COLA CLASSIC R	1	12	OZ
GPC 2 UL L M F UT 85 P - .30	CIGARETTES	TOBACCO & ACCESSORIES	NON-FOOD GROCERY	GPC	1	20	CT
GPC 2 UL L M F UT 85 C - 2.00	CIGARETTES	TOBACCO & ACCESSORIES	NON-FOOD GROCERY	GPC	10	20	CT

Source: Nielsen's Retail Scanner Data.

Table A2 : Descriptive Statistics

	All counties	Counties with high sales tax rate	Counties with low sales tax rate	Linear Relationship with tax rate
	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Coefficient (s.e.)
	(1)	(2)	(3)	(4)
Retail Scanner Data				
Total grocery store sales in county ($ million)	74.5	85.9	62.7	0.061**
	(203.3)	(261.6)	(113.3)	(0.025)
Average store-level sales ($ million)	9.6	9.3	10.0	-0.051**
	(4.5)	(4.3)	(4.6)	(0.025)
Average store-level food share of total sales	0.753	0.751	0.754	0.086***
	(0.055)	(0.053)	(0.057)	(0.025)
Average store-module-level price index	-0.015	-0.015	-0.015	-0.149***
	(0.039)	(0.038)	(0.039)	(0.025)
Average store-module-level variety	101.3	99.0	103.7	-0.075***
	(23.7)	(23.3)	(23.9)	(0.025)
Number of grocery stores	6.5	7.6	5.4	0.071***
	(15.9)	(20.5)	(8.8)	(0.025)
Sales Taxes				
Average sales tax rate	0.063	0.073	0.052	
	(0.017)	(0.008)	(0.017)	
Average sales tax rate on food products	0.016	0.019	0.012	
	(0.022)	(0.025)	(0.019)	
Difference between effective rates on nonfood and food	0.047	0.054	0.040	
	(0.024)	(0.022)	(0.023)	
Other county characteristics				
Population	164,735	194,155	134,083	0.109***
	(415237)	(534496)	(229760)	(0.025)
Household median income	43,961	42,908	45,058	-0.041
	(11640)	(11504)	(11687)	(0.025)
Share population with high school degree or less	49.9	51.5	48.2	0.187***
	(11.2)	(11.1)	(11.1)	(0.025)
Land area	1,024	865	1,189	-0.170***
	(1565)	(1369)	(1731)	(0.025)
Other Taxes				
Property tax rate	0.009	0.009	0.009	-0.072***
	(0.005)	(0.005)	(0.005)	(0.025)
Average gasoline excise tax rate	0.264	0.264	0.263	-0.010
	(0.089)	(0.090)	(0.088)	(0.025)
Average cigarette excise tax ($)	1.287	1.269	1.316	0.031
	(0.893)	(0.983)	(0.816)	(0.025)
Average alcohol excise tax ($)	2.070	1.871	2.282	-0.349***
	(1.409)	(1.115)	(1.642)	(0.023)
Top Marginal Income Tax Rate	0.056	0.057	0.055	-0.073***
	(0.028)	(0.033)	(0.023)	(0.025)
Number of counties	1,560	796	764	1,560

Note: Sales tax rates efffective on September 1, 2008. Sales, pre-tax prices and variety are measured yearly, for 2008. The Retail Scanner data is restricted to modules above the 80th percentile of the national distribution of sales. Column 2 restricts the sample to counties for which the total sales tax rate is greater than the median, and column (3) is restricted to below-median counties. Column 4 reports the coefficient from a regression of the tax rate on the county characteristic. In each regressions, all variables are standardized with mean zero and unit variance.

* p<0.1 ** p<0.05 *** p<0.01

Table A3: The Long-Run Effect of Sales Taxes on Variety - Alternative Measures

Sample:	Full Sample				Border counties			
Dependent Variable:	Variety count		Variety share		Variety count		Variety share	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\log(1+\tau_{mcs})$	-0.854	-0.828	-0.474	-0.618	-0.561	-0.317	-0.299	-0.209
	(0.151)	(0.126)	(0.152)	(0.118)	(0.144)	(0.073)	(0.142)	(0.065)
Specification:								
Store fixed effects	y	y	y	y	y	y	y	y
Module fixed effects	y		y		y		y	
Module × Region fixed effects		y		y				
Module × Pair fixed effects						y		y
N (observations)	17,320,024	17,320,024	17,319,895	17,319,895	14,113,781	14,113,781	14,113,781	14,113,781
N (modules)	198	198	198	198	198	198	198	198
N (stores)	11,487	11,487	11,487	11,487	4,040	4,040	4,040	4,040
N (counties)	1,625	1,625	1,625	1,625	636	636	636	636
N (county-modules)	308,977	308,977	308,977	308,977	120,876	120,876	120,876	120,876

Notes: Sales tax rates efffective on September 1. Variety counts and shares are measured yearly. All coefficients are linear combinations of nine coefficients -- one for each year from 2006 to 2014. Columns (1) to (4): All standard errors are clustered at the state-module level. Columns (5) to (8): The sample is restricted to border counties. Observations are weighted by the inverse of number of pairs a county belongs to. All coefficients are linear combinations of nine coefficients -- one for each year from 2006 to 2014. All standard errors are clustered two-way at the state-module level and at the border segment-module level.

Table A4: The Long-Run Effect of Sales Taxes -- Difference-in-Differences Model

Dependent Variable:	Prices		Quantity		Variety	
	(1)	(2)	(3)	(4)	(5)	(6)
Non-Food Module × $\log(1+\tau_{cs})$	0.893	0.845	-0.788	-0.695	-0.987	-1.092
	(0.074)	(0.049)	(0.582)	(0.409)	(0.299)	(0.200)
Specification:		0				
Store fixed effects	y	y	y	y	y	y
Module fixed effects	y		y		y	
Module × Region fixed effects		y		y		y
N (observations)	9,653,999	9,653,999	9,653,999	9,653,999	9,653,999	9,653,999
N (modules)	148	148	148	148	148	148
N (stores)	8,682	8,682	8,682	8,682	8,682	8,682
N (counties)	1,134	1,134	1,134	1,134	1,134	1,134
N (county-modules)	163,926	163,926	163,926	163,926	163,926	163,926
R^2	0.394	0.495	0.831	0.862	0.844	0.863

Notes: Sales tax rates efffective on September 1. Sales, prices and variety are measured yearly. The Retail Scanner data is restricted to modules above the 80th percentile of the national distribution of sales. The sample is restricted to states where food products are exempt from the state sales tax, and to modules that are either taxed or exempt in all of these states. All standard errors are clustered at the state-module level.

Table A5: Robustness of Long-Run Estimates to Alternative Specifications and Sample Restrictions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable:									
Log of Average Consumer Price	1.148	1.062	1.233	1.118	1.176	1.056	1.048	0.964	1.079
	(0.036)	(0.025)	(0.040)	(0.031)	(0.038)	(0.026)	(0.069)	(0.050)	(0.017)
Log of Quantity	-0.864	-0.790	-1.239	-1.039	-1.329	-1.076	-0.916	-0.929	-0.876
	(0.270)	(0.208)	(0.315)	(0.273)	(0.267)	(0.217)	(0.380)	(0.287)	(0.116)
Log of Variety (# of UPCs)	-0.854	-0.828	-0.806	-0.764	-0.921	-0.855	-0.741	-0.791	-0.972
	(0.151)	(0.126)	(0.196)	(0.174)	(0.149)	(0.125)	(0.216)	(0.166)	(0.069)
Specification:									
Store Fixed Effects	y	y	y	y	y	y	y	y	y
Module fixed effects	y		y		y		y		
Module × Region fixed effects		y		y		y		y	y
Restrict to Non-DD sample			y	y					
Restrict to Large Counties (>150k)					y	y			
Instrument with State Tax Rates							y	y	
Include Low Expenditure Modules									y
N (observations)	17,320,024	17,320,024	7,666,025	7,666,025	12,373,721	12,373,721	17,320,024	17,320,024	79,376,154
N (modules)	198	198	198	198	198	198	198	198	975
N (stores)	11,487	11,487	11,487	11,487	8,211	8,211	11,487	11,487	11,487
N (counties)	1,625	1,625	1,625	1,625	368	368	1,625	1,625	1,625
N (county-modules)	308,977	308,977	157,723	157,723	70,481	70,481	308,977	308,977	1,521,153

Notes: All coefficients are linear combinations of nine coefficients -- one for each year from 2006 to 2014. All standard errors are clustered at the state-module level. In columns (3) and (4), the sample is restricted to module-county cells that do not fullfil the restriction criteria of the difference-in-differences approach. Columns (5) and (6) restricts the sample to counties with a population larger than 150,000. The county-level effective tax rate is instrumented with the state-level effective rate in columns (7) and (8). In column (9), all modules that are sold in all 48 continental states are included.

Table A6: Robustness of Short-Run Estimates to Alternative Specifications and Sample Restrictions

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:						
Log of Average Consumer Price	1.064	1.012	1.088	1.121	1.036	1.165
	(0.049)	(0.032)	(0.0604)	(0.0523)	(0.0354)	(0.0640)
Log of Quantity	-0.448	-0.216	-0.287	-0.552	-0.227	-0.498
	(0.149)	(0.138)	(0.168)	(0.160)	(0.144)	(0.176)
Log of Variety (# of UPCs)	-0.011	-0.085	0.163	-0.0941	-0.174	0.0311
	(0.112)	(0.100)	(0.142)	(0.127)	(0.111)	(0.156)
Specification:						
Store, Time, Module fixed effects	y	y	y	y	y	y
Module × Store fixed effects	y	y	y	y	y	y
Module-specific linear time trend	y		y	y		y
Module × Time fixed effects		y			y	
Store × Time fixed effects			y			y
Restrict to Large Counties (>150k)				y	y	y
N (observations)	68,076,928	68,076,928	68,076,928	48,680,109	48,680,109	48,680,109
N (modules)	198	198	198	198	198	198
N (stores)	11,487	11,487	11,487	8,211	8,211	8,211
N (counties)	1,625	1,625	1,625	368	368	368
N (quarters)	36	36	36	36	36	36
N (county-modules)	308,977	308,977	308,977	70,481	70,481	70,481

Notes: A unit of time is a quarter, and the period covered is 2006-2014. In columns (4) to (6), the sample is restricted to stores located in counties with a population greater than 150,000. Standard errors are clustered at the state-module level in all specifications.

Table A7: Robustness of Variety Effect Estimates in Sales Tax Application

	Baseline	Robustness			
Long-run reduced-form estimates	Table 2, odd # columns	Table A5, column (5)	Table A5, column (8)	Table 2, odd # columns	Table 2, odd # columns
Short-run reduced-form estimates	Table 3, odd # columns	Table 3, odd # columns	Table 3, odd # columns	Table A6, column (2)	Table A6, column (6)
	(1)	(2)	(3)	(4)	(5)
Cross-sectional estimates (endogenous J)					
Price response, dlog(p)/dz	1.15	1.18	0.96	1.15	1.15
Output response, dlog(Q)/dz	-0.86	-1.33	-0.93	-0.86	-0.86
Variety response, dlog(J)/dz	-0.85	-0.92	-0.79	-0.85	-0.85
Short-run estimates (fixed J)					
Price response, dlog(p)/dz |J	1.06	1.06	1.06	1.012	1.17
Quantity response, dlog(Q)/dz |J	-0.45	-0.45	-0.45	-0.22	-0.50
Variety effect "plug-in" estimate					
Adjusted Variety Effect (θ=0.43)	0.311	0.762	0.654	1.399	0.210

Notes: The first column reports the variety effects for our baseline estimates. In columns (2) and (3), we use long-run estimates from our robustness checks (Table A5, columns (5) and (8) respectively). In the last two columns, short-run estimates from our robustness checks are used (Table A6, columns (2) and (6) respectively).

Table C1: Sources of sales tax exemption information

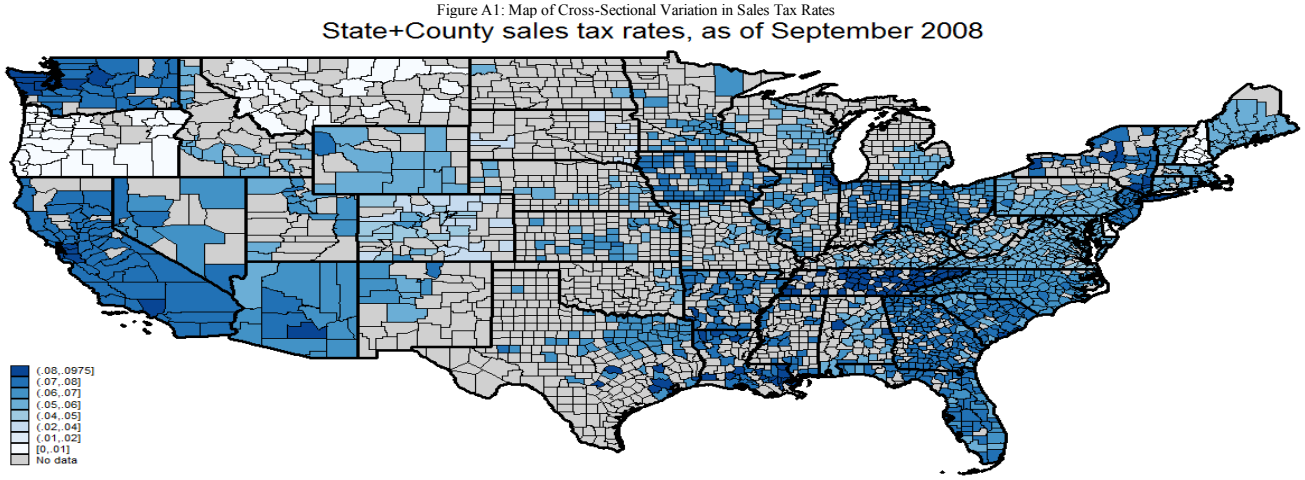
State	URLs	Type of Document
AL	http://revenue.alabama.gov/salestax/rules/810-6-5-.02.pdf	Laws and Regulations
AL	http://www.alabamaadministrativecode.state.al.us/docs/rev/810-6-3.pdf	Laws and Regulations
AL	http://revenue.alabama.gov/publications/business-taxes/sales/Sales_Tax--Sales_Tax_Brochure.pdf	Brochure
AZ	http://www.azleg.state.az.us/ArizonaRevisedStatutes.asp?Title=42	Laws and Regulations
AZ	http://www.azsos.gov/public_services/Title_15/15-05.htm	Laws and Regulations
AZ	https://www.azdor.gov/Portals/0/TPTRates/08012016RateTable.pdf	Table
AZ	https://www.azdor.gov/Portals/0/Brochure/575.pdf	Brochure
AR*	http://www.lexisnexis.com/hottopics/arcode/Default.asp	Laws and Regulations
AR*	http://www.dfa.arkansas.gov/offices/policyAndLegal/Documents/et2008_3.pdf	Laws and Regulations
AR*	http://www.dfa.arkansas.gov/offices/policyAndLegal/Documents/et2007_3.pdf	Laws and Regulations
AR*	http://www.dfa.arkansas.gov/offices/exciseTax/salesanduse/Documents/SalesTaxExemptionsFY2011.pdf	Brochure
CA	http://www.boe.ca.gov/lawguides/business/current/btlg/business-taxes-law-guide.html	Laws and Regulations
CA	https://www.boe.ca.gov/pdf/pub31.pdf	Brochure
CA	https://www.boe.ca.gov/pdf/pub27.pdf	Brochure
CA	https://www.boe.ca.gov/pdf/pub61.pdf	Brochure
CO	https://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=4753	Laws and Regulations
CO	http://codes.findlaw.com/co/title-39-taxation/co-rev-st-sect-39-26-707.html	Laws and Regulations
CO	https://www.colorado.gov/pacific/sites/default/files/DR1002.pdf	Brochure
CO	https://www.colorado.gov/pacific/sites/default/files/Sales04.pdf	Brochure
CT	http://www.cga.ct.gov/2011/pub/chap219.htm	Laws and Regulations
CT	https://www.cga.ct.gov/2011/rpt/2011-R-0238.htm	Brochure
CT	http://www.ct.gov/drs/cwp/view.asp?A=1514&Q=563394	Brochure
CT	http://www.ct.gov/drs/cwp/view.asp?a=1511&q=267404	Brochure
DE	http://revenue.delaware.gov/services/current_bt/taxtips/grocery.pdf	Brochure
FL	http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0200-0299/0212/0212ContentsIndex.html	Laws and Regulations
FL	https://www.flrules.org/gateway/ChapterHome.asp?Chapter=12A-1	Laws and Regulations
FL	http://floridarevenue.com/Forms_library/current/dr46nt.pdf	Brochure
GA*	http://www.lexisnexis.com/hottopics/gacode/Default.asp	Laws and Regulations
GA*	http://garules.elaws.us/rule/560-12-2	Laws and Regulations
GA*	https://dor.georgia.gov/sites/dor.georgia.gov/files/related_files/document/LATP/Bulletin/2016%20List%20of%20Sales%20and%20Use%20Tax%20Exemptions.pdf	Brochure
ID	http://adminrules.idaho.gov/rules/current/35/0102.pdf	Laws and Regulations
ID	http://www.legislature.idaho.gov/idstat/Title63/T63CH36.htm	Laws and Regulations
ID	https://tax.idaho.gov/pubs/EBR00012_07-01-2001.pdf	Brochure
ID	https://tax.idaho.gov/pubs/EBR00016_03-23-2015.pdf	Brochure
IL	ftp://www.ilga.gov/JCAR/AdminCode/086/08600130sections.html	Laws and Regulations
IL	http://www.revenue.state.il.us/publications/Bulletins/2010/FY-2010-01.PDF	Brochure
IL	http://www.revenue.state.il.us/Publications/Pubs/Pub-117.pdf	Brochure
IN*	http://codes.findlaw.com/in/title-6-taxation/	Laws and Regulations
IN*	http://www.in.gov/legislative/iac/20080827-IR-045080658NRA.xml.pdf	Brochure
IA*	https://www.legis.iowa.gov/law/iowaCode/chapters?title=X	Laws and Regulations
IA*	http://law.justia.com/codes/iowa/2013/titlex/subtitle1/chapter423	Laws and Regulations
IA*	https://tax.iowa.gov/iowa-sales-tax-food	Brochure
KS*	http://kansasstatutes.lesterama.org/Chapter_79/	Laws and Regulations
KS*	http://rvpolicy.kdor.ks.gov/Pilots/Ntrntpil/IPILv1x0.NSF/$$ViewTemplate%20for%20Regulations%20Only?OpenForm	Laws and Regulations
KS*	http://www.ksrevenue.org/pdf/pub1510.pdf	Brochure
KY*	http://www.lrc.ky.gov/Statutes/chapter.aspx?id=37663	Laws and Regulations
KY*	http://www.lrc.ky.gov/kar/TITLE103.HTM	Laws and Regulations
KY*	http://revenue.ky.gov/Documents/AppendixN_CandyProduct91114.pdf	Brochure
KY*	http://revenue.ky.gov/News/Publications/Pages/Sales-Tax-Facts.aspx	Brochure
LA	http://www.legis.state.la.us/lss/lss.asp?folder=121	Laws and Regulations
LA	http://www.doa.louisiana.gov/osr/lac/61v01/61v01.doc	Laws and Regulations
LA	http://www.rev.state.la.us/Miscellaneous/FoodExemptionFlyer.pdf	Brochure
LA	http://revenue.louisiana.gov/Publications/R-1002(01-17)%20FINAL.pdf	Brochure

ME	http://www.mainelegislature.org/legis/statutes/36/title36ch0sec0.html	Laws and Regulations
ME	http://www.maine.gov/revenue/salesuse/Bull1220160101v2.pdf	Brochure
ME	http://www.maine.gov/revenue/salesuse/Bull2720160101v2.pdf	Brochure
MD	http://www.lexisnexis.com/hottopics/mdcode/	Laws and Regulations
MD	http://www.dsd.state.md.us/COMAR/title_search/Title_List.aspx	Laws and Regulations
MD	http://taxes.marylandtaxes.com/Resource_Library/Tax_Publications/Tax_Tips/Business_Tax_Tips/bustip5.pdf	Brochure
MA	https://malegislature.gov/Laws/GeneralLaws/PartI/TitleIX/Chapter64H	Laws and Regulations
MA	http://www.mass.gov/dor/individuals/taxpayer-help-and-resources/tax-guides/salesuse-tax-guide.html	Brochure
MI*	http://w3.lara.state.mi.us/orrsearch/948_2010-012TY_AdminCode.pdf	Laws and Regulations
MI*	https://www.michigan.gov/documents/treasury/RAB_2009-8_Food_for_Human_Consumption_Oct_09_299470_7.pdf	Brochure
MN*	https://www.revisor.mn.gov/statutes/?id=297A.67	Laws and Regulations
MN*	http://www.revenue.state.mn.us/businesses/sut/factsheets/FS102A.pdf	Brochure
MN*	http://www.revenue.state.mn.us/businesses/sut/factsheets/FS102B.pdf	Brochure
MN*	http://www.revenue.state.mn.us/businesses/sut/factsheets/FS102C.pdf	Brochure
MN*	http://www.revenue.state.mn.us/businesses/sut/factsheets/FS102D.pdf	Brochure
MN*	http://www.revenue.state.mn.us/businesses/sut/factsheets/FS117A.pdf	Brochure
MN*	http://www.revenue.state.mn.us/businesses/sut/factsheets/FS117F.pdf	Brochure
MS	http://www.lexisnexis.com/hottopics/mscode/	Laws and Regulations
MS	http://www.sos.ms.gov/admincodesearch/default.aspx	Laws and Regulations
MS	https://www.dor.ms.gov/Laws-Rules/Documents/Part%20IV%20Sales%20and%20Use%20Tax%2092216.pdf	Laws and Regulations
MS	http://www.dor.ms.gov/Business/Pages/Sales-Tax-Exemptions.aspx	Brochure
MO	http://www.moga.mo.gov/mostatutes/stathtml/14400000301.html	Laws and Regulations
MT	https://revenue.mt.gov/home/individuals/businesses_otherinformation#Sales%20Tax	Brochure
NE*	http://www.revenue.nebraska.gov/legal/regs/slstaxregs.html	Laws and Regulations
NE*	http://www.nebraskalegislature.gov/laws/browse-chapters.php?chapter=77	Laws and Regulations
NE*	http://www.revenue.nebraska.gov/info/6-432.pdf	Brochure
NE*	http://www.revenue.nebraska.gov/info/6-437.pdf	Brochure
NV*	http://www.leg.state.nv.us/NRS/NRS-372.html	Laws and Regulations
NV*	http://www.leg.state.nv.us/NAC/NAC-372.html	Laws and Regulations
NV*	https://tax.nv.gov/FAQs/Sales_Tax_Information___FAQ_s/	Brochure
NH	https://www.revenue.nh.gov/assistance/tax-overview.htm	Brochure
NJ*	http://law.justia.com/codes/new-jersey/2009/title-54/54-32b	Laws and Regulations
NJ*	http://www.state.nj.us/treasury/taxation/pdf/pubs/sales/su4.pdf	Brochure
NJ*	http://www.state.nj.us/treasury/taxation/pdf/ssutfood.pdf	Brochure
NM	http://www.nmcpr.state.nm.us/nmac/_title03/T03C002.htm	Laws and Regulations
NM	http://public.nmcompcomm.us/nmpublic/gateway.dll/?f=templates&fn=default.htm	Laws and Regulations
NM	http://realfile.tax.newmexico.gov/FYI-105%20-%20Gross%20Receipts%20&%20Compensating%20Taxes%20-%20An%20Overview.pdf	Brochure
NM	http://www.zillionforms.com/2016/P668403604.PDF	Brochure
NY	http://codes.findlaw.com/ny/tax-law/tax-sect-1105.html	Laws and Regulations
NY	https://govt.westlaw.com/nycrr/Document/I50f2201ecd1711dda432a117e6e0f345?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)	Laws and Regulations
NY	https://www.tax.ny.gov/pdf/publications/sales/pub840.pdf	Brochure
NY	https://www.tax.ny.gov/pdf/publications/sales/pub750.pdf	Brochure
NY	https://www.tax.ny.gov/pdf/memos/sales/m11_3s.pdf	Brochure
NY	https://www.tax.ny.gov/pdf/memos/sales/m06_6s.pdf	Brochure
NY	https://www.tax.ny.gov/pdf/tg_bulletins/sales/b11_525s.pdf	Brochure
NY	https://www.tax.ny.gov/pdf/tg_bulletins/sales/b14_103s.pdf	Brochure
NY	https://www.tax.ny.gov/pdf/tg_bulletins/sales/b11_160s.pdf	Brochure
NY	https://www.ny.gov/sites/ny.gov/files/atoms/files/GuideForTaxableandExemptPropertyandServices.pdf	Brochure
NC*	http://www.ncga.state.nc.us/gascripts/Statutes/StatutesTOC.pl?Chapter=0105	Laws and Regulations
NC*	http://www.dornc.com/practitioner/sales/bulletins/toc.html	Laws and Regulations
NC*	http://www.dornc.com/taxes/sales/foodnotice6-06.pdf	Brochure
ND*	http://law.justia.com/codes/north-dakota/2013/title-57/chapter-57-39.2	Laws and Regulations
ND*	https://www.nd.gov/tax/data/upfiles/media/gl-22062.pdf?20170414121353	Brochure

OH*	http://codes.ohio.gov/orc/5739	Laws and Regulations
OH*	http://www.tax.ohio.gov/portals/0/sales_and_use/information_releases/st200401.pdf	Brochure
OK*	http://law.justia.com/codes/oklahoma/2006/os68.html	Laws and Regulations
OK*	https://www.ok.gov/tax/documents/rule6509.pdf	Laws and Regulations
OK*	https://www.ou.edu/controller/fss/dwnload/SalesTax%20GeneralFAQs.pdf	Brochure
OR	http://landru.leg.state.or.us/ors/	Laws and Regulations
OR	http://arcweb.sos.state.or.us/pages/rules/oars_100/oar_150/150_tofc.html	Laws and Regulations
PA	http://www.pacode.com/secure/data/061/061toc.html	Laws and Regulations
PA	http://www.revenue.pa.gov/FormsandPublications/FormsforBusinesses/Documents/Sales-Use%20Tax/rev-717.pdf	Brochure
RI*	http://www.tax.ri.gov/regulations/FINAL%20REGS%202009/FoodandFoodIngredientsRegFinal%20v2%2002122010.pdf	Laws and Regulations
RI*	http://law.justia.com/codes/rhode-island/2010/title44/chapter44-18/	Laws and Regulations
RI*	http://www.tax.ri.gov/regulations/salestax/11-60.pdf	Laws and Regulations
RI*	http://www.tax.state.ri.us/streamlined/candy_soft_diet.php	Brochure
SC	http://www.scstatehouse.gov/code/t12c036.php	Laws and Regulations
SC	http://www.scstatehouse.gov/coderegs/c117.php	Laws and Regulations
SC	https://dor.sc.gov/resources-site/lawandpolicy/Advisory%20Opinions/RR06-5.pdf	Laws and Regulations
SC	https://dor.sc.gov/resources-site/publications/Publications/Sales%20and%20Use%20Tax%20Manual%202015%20Edition-Web.pdf	Brochure
SC	http://media.clemson.edu/procurement/2011SalesTaxSeminarManual_May.pdf	Brochure
SD*	http://legis.sd.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=10-45	Laws and Regulations
SD*	http://dor.sd.gov/taxes/business_taxes/publications/pdfs/stguide2014.pdf	Brochure
SD*	http://dor.sd.gov/Publications/2013_Session_Presentations/PDFs/SummaryofStateSalesTaxExemptions0113.pdf	Brochure
TN*	http://www.lexisnexis.com/hottopics/tncode/	Laws and Regulations
TN*	https://www.tnumc.org/wp-content/uploads/2016/04/TN-Sales-Tax-booklet-2013.pdf	Brochure
TN*	https://revenue.support.tn.gov/hc/en-us/article_attachments/202401125/Notice__13-05.pdf	Brochure
TX	http://www.statutes.legis.state.tx.us/	Laws and Regulations
TX	https://comptroller.texas.gov/taxes/publications/96-280.pdf	Brochure
TX	https://comptroller.texas.gov/taxes/publications/94-155.pdf	Brochure
TX	https://comptroller.texas.gov/taxes/audit/docs/convenience-manual.pdf	Brochure
UT*	http://le.utah.gov/UtahCode/chapter.jsp?code=59	Laws and Regulations
UT*	http://www.tax.utah.gov/sales/food-rate	Brochure
UT*	http://www.tax.utah.gov/forms/pubs/pub-25.pdf	Brochure
VT*	http://www.leg.state.vt.us/statutes/sections.cfm?Title=32&Chapter=233	Laws and Regulations
VT*	http://www.state.vt.us/tax/pdf.word.excel/legal/regs/SU.finals.11012010.pdf	Laws and Regulations
VT*	http://tax.vermont.gov/sites/tax/files/documents/SalesTaxTaxable%26ExemptFS.pdf	Brochure
VA	http://law.lis.virginia.gov/vacode/title58.1/chapter6/	Laws and Regulations
VA	http://lis.virginia.gov/000/reg/TOC23010.HTM#C0210	Laws and Regulations
VA	https://www.tax.virginia.gov/laws-rules-decisions/rulings-tax-commissioner/05-78	Brochure
VA	https://www.tax.virginia.gov/sites/default/files/inline-files/TB%2013-5%20Nonprescription%20Drugs.pdf	Brochure
WA*	http://apps.leg.wa.gov/rcw/default.aspx?cite=82.08	Laws and Regulations
WA*	http://apps.leg.wa.gov/WAC/default.aspx?cite=458-20	Laws and Regulations
WA*	http://dor.wa.gov/Docs/Pubs/SpecialNotices/2012/sn_12_SoftDrinks.pdf	Brochure
WA*	http://dor.wa.gov/Docs/Pubs/SpecialNotices/2010/sn_10_WaterCandyGumTaxRepeal.pdf	Brochure
WA*	http://dor.wa.gov/content/aboutus/statisticsandreports/stats_ExemptionStudy.aspx	Brochure
WV*	http://www.legis.state.wv.us/wvcode/Code.cfm?chap=11&art=1	Laws and Regulations
WV*	http://tax.wv.gov/Documents/TSD/tsd300.pdf	Brochure
WV*	http://tax.wv.gov/Documents/TSD/tsd419.pdf	Brochure
WV*	http://tax.wv.gov/Documents/TSD/tsd420.pdf	Brochure
WI*	https://docs.legis.wisconsin.gov/statutes/statutes/77/III/51	Laws and Regulations
WI*	https://www.revenue.wi.gov/DOR%20Publications/pb220.pdf	Brochure
WY*	http://www.lexisnexis.com/hottopics/wystatutes/	Laws and Regulations
WY*	http://revenue.wyo.gov/home/rules-and-regulations-by-chapter	Laws and Regulations
WY*	http://revenue.wyo.gov/FoodExemption.pdf?attredirects=0	Brochure

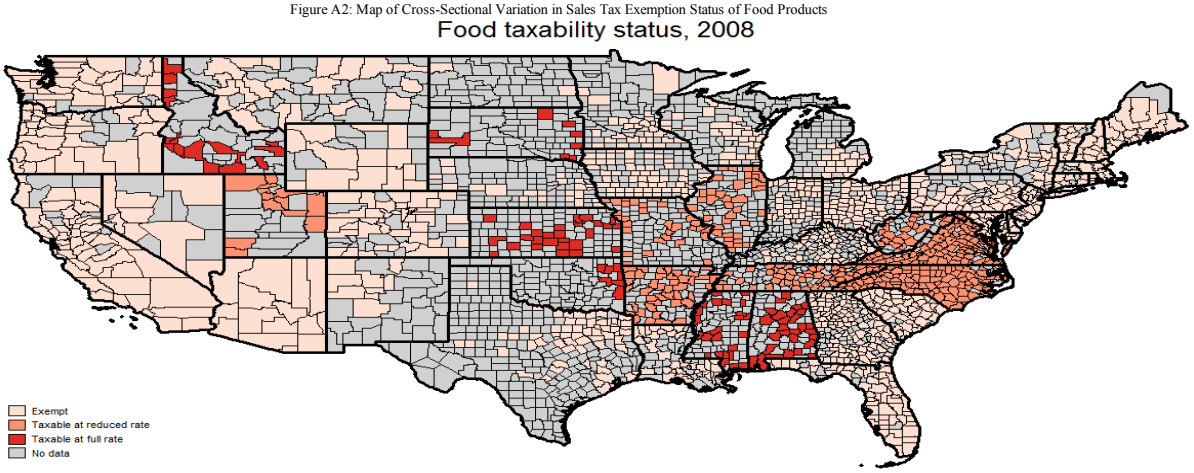
* States indexed participate in the Streamlined Sales Tax Project (SSTP): http://www.streamlinedsalestax.org/

Figure A1: Map of Cross-Sectional Variation in Sales Tax Rates



Note: 'No data' indicates counties for which no grocery store sales were recorded in Nielsen's Retail Scanner data in 2008.

Figure A2: Map of Cross-Sectional Variation in Sales Tax Exemption Status of Food Products



Note: 'No data' indicates counties for which no grocery store sales were recorded in Nielsen's Retail Scanner data in 2008.

Robustness of Long-Run Estimates to Alternative Specifications and Sample Restrictions

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable:										
Log of Expenditure Share	0.330	-0.651	-0.847	-1.681**	-1.651***	-0.922	-0.733	-0.584	-0.351	-0.788
	(0.547)	(0.553)	(0.560)	(0.669)	(0.632)	(0.599)	(0.620)	(0.623)	(0.618)	(0.582)
Log of Average Consumer Price	0.848***	0.904***	0.843***	0.948***	0.992***	0.942***	0.930***	0.834***	0.796***	0.893
	(0.091)	(0.083)	(0.078)	(0.083)	(0.087)	(0.084)	(0.083)	(0.081)	(0.082)	(0.074)
Log of Variety (# of UPCs)	-0.310	-0.782***	-1.140***	-1.255***	-1.269***	-0.965***	-0.989***	-1.166***	-1.009***	-0.987
	(0.290)	(0.299)	(0.306)	(0.340)	(0.336)	(0.323)	(0.334)	(0.341)	(0.344)	(0.299)
Specification:										
Store Fixed Effects	y	y	y	y	y	y	y	y	y	y
Module fixed effects	y	y	y	y	y	y	y	y	y	y

Notes: All standard errors are clustered at the state-module level.

Robustness of Long-Run Estimates to Alternative Specifications and Sample Restrictions

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable:										
Log of Expenditure Share	0.826**	-0.497	-0.716*	-1.391***	-1.525***	-0.965**	-0.818*	-0.703	-0.464	-0.695
	(0.387)	(0.401)	(0.399)	(0.437)	(0.421)	(0.431)	(0.437)	(0.438)	(0.445)	(0.409)
Log of Average Consumer Price	0.837***	0.877***	0.828***	0.856***	0.869***	0.890***	0.876***	0.801***	0.773***	0.845
	(0.057)	(0.054)	(0.050)	(0.050)	(0.061)	(0.065)	(0.062)	(0.062)	(0.060)	(0.049)
Log of Variety (# of UPCs)	-0.364*	-0.914***	-1.295***	-1.383***	-1.433***	-1.114***	-1.078***	-1.207***	-1.037***	-1.092
	(0.208)	(0.221)	(0.211)	(0.214)	(0.214)	(0.220)	(0.218)	(0.232)	(0.239)	(0.200)
Specification:										
Store Fixed Effects	y	y	y	y	y	y	y	y	y	y
Module × Region fixed effects	y	y	y	y	y	y	y	y	y	y

Notes: All standard errors are clustered at the state-module level.

Robustness of Long-Run Estimates to Alternative Specifications and Sample Restrictions

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable:										
Log of Expenditure Share	-0.824***	-1.060***	-0.972***	-1.188***	-1.044***	-0.799***	-0.754***	-0.564*	-0.569*	-0.864
	(0.279)	(0.281)	(0.272)	(0.278)	(0.281)	(0.282)	(0.291)	(0.293)	(0.292)	(0.270)
Log of Average Consumer Price	1.102***	1.145***	1.148***	1.170***	1.198***	1.207***	1.211***	1.093***	1.057***	1.148
	(0.048)	(0.044)	(0.040)	(0.041)	(0.042)	(0.041)	(0.041)	(0.040)	(0.041)	(0.036)
Log of Variety (# of UPCs)	-0.759***	-0.827***	-0.914***	-0.962***	-0.833***	-0.719***	-0.827***	-0.900***	-0.945***	-0.854
	(0.157)	(0.166)	(0.162)	(0.160)	(0.163)	(0.167)	(0.169)	(0.168)	(0.176)	(0.151)
Specification:										
Store Fixed Effects	y	y	y	y	y	y	y	y	y	y
Module fixed effects	y	y	y	y	y	y	y	y	y	y

Notes: All standard errors are clustered at the state-module level.

Robustness of Long-Run Estimates to Alternative Specifications and Sample Restrictions

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable:										
Log of Expenditure Share	-0.385*	-0.861***	-0.817***	-1.175***	-1.009***	-0.755***	-0.786***	-0.663***	-0.657***	-0.790
	(0.214)	(0.218)	(0.214)	(0.207)	(0.217)	(0.223)	(0.223)	(0.226)	(0.231)	(0.208)
Log of Average Consumer Price	1.045***	1.110***	1.084***	1.066***	1.081***	1.088***	1.090***	1.012***	0.980***	1.062
	(0.032)	(0.031)	(0.029)	(0.029)	(0.031)	(0.032)	(0.030)	(0.031)	(0.031)	(0.025)
Log of Variety (# of UPCs)	-0.762***	-0.853***	-0.958***	-1.037***	-0.897***	-0.647***	-0.697***	-0.826***	-0.774***	-0.828
	(0.135)	(0.138)	(0.133)	(0.129)	(0.137)	(0.143)	(0.140)	(0.140)	(0.148)	(0.126)
Specification:										
Store Fixed Effects	y	y	y	y	y	y	y	y	y	y
Module × Region fixed effects	y	y	y	y	y	y	y	y	y	y

Notes: All standard errors are clustered at the state-module level.

Robustness of Long-Run Estimates - Border-design

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable:										
Log of Expenditure Share	-0.769***	-0.957***	-0.724***	-0.930***	-0.682***	-0.604**	-0.567**	-0.304	-0.240	-0.642
	(0.277)	(0.279)	(0.270)	(0.252)	(0.259)	(0.262)	(0.261)	(0.255)	(0.256)	(0.246)
Log of Average Consumer Price	1.099***	1.112***	1.107***	1.161***	1.123***	1.120***	1.116***	1.026***	1.002***	1.096
	(0.042)	(0.039)	(0.037)	(0.034)	(0.035)	(0.035)	(0.036)	(0.035)	(0.035)	(0.031)
Log of Variety (# of UPCs)	-0.581***	-0.658***	-0.679***	-0.708***	-0.547***	-0.439***	-0.502***	-0.558***	-0.376**	-0.561
	(0.168)	(0.170)	(0.162)	(0.152)	(0.156)	(0.157)	(0.161)	(0.157)	(0.166)	(0.144)
Specification:										
Store Fixed Effects	y	y	y	y	y	y	y	y	y	y
Module fixed effects	y	y	y	y	y	y	y	y	y	y

Notes: All standard errors are clustered at the state-module level and at the border-segment level.

Robustness of Long-Run Estimates - Border-design

Year:	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable:										
Log of Expenditure Share	-0.356**	-0.769***	-0.816***	-1.041***	-0.864***	-0.646***	-0.674***	-0.770***	-0.552***	-0.721
	(0.141)	(0.166)	(0.180)	(0.171)	(0.179)	(0.165)	(0.157)	(0.162)	(0.168)	(0.151)
Log of Average Consumer Price	1.023***	1.063***	1.047***	1.070***	1.051***	1.028***	1.013***	1.004***	1.034***	1.037
	(0.020)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)	(0.019)	(0.019)	(0.020)	(0.017)
Log of Variety (# of UPCs)	-0.163**	-0.275**	-0.294***	-0.491***	-0.416***	-0.282***	-0.212***	-0.422***	-0.300***	-0.317
	(0.081)	(0.087)	(0.092)	(0.085)	(0.088)	(0.087)	(0.080)	(0.090)	(0.096)	(0.073)
Specification:										
Store Fixed Effects	y	y	y	y	y	y	y	y	y	y
Module × Pair fixed effects	y	y	y	y	y	y	y	y	y	y

Notes: All standard errors are clustered at the state-module level and at the border-segment level.