Pricing Like the Competition: Excessive Tax Pass-through and Retail Pricing in the Mexican Soda Market

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Abstract

I analyze price adjustments following Mexico's 2014 tax on sugar-sweetened beverages (SSBs). First, I show evidence of tax over-shifting: in response to a one-peso tax, retailers increased prices by 1.32 pesos. I find that local competition partially limits over-shifting. Second, when adjusting prices, stores use a "catch-up" strategy meaning the price of cheaper products increases more than the price of more expensive products. Third, I find evidence of uniform adjustments to the tax at the store-chain level targeting modal prices across chains. Together, these results suggest that retailers facing more competition do in fact lower prices that are initially set by a store's chain and contradict the hypothesis that taxes are smoothly passed into prices.

Introduction

The use of a tax policy to reduce consumption assumes that prices will rise in response to the tax, which, in turn, would reduce the quantity demanded. Theoretically, however, the burden of taxation depends on the market structure. Under perfect competition, taxes can be either partially or fully transmitted into prices. Under imperfect competition, over-shifting is possible—i.e., a dollar in tax increases prices by more than one dollar. Moreover, most tax incidence models deliver the prediction that more competition reduces firms' incentives to shift taxes under the same conditions that induce over-shifting.

In this paper, I test the conventional wisdom using the Mexican excise tax of one peso (Mxn) per liter on SSBs effective January 1, 2014. I first estimate the average tax pass-through on retail prices and evaluate its' sensibility to local competition. Next, I study a potential mechanism by which several empirical studies, including this one, find that conditional on over-shifting, local competition alone cannot avoid excessive shifting. I show how pricing strategies such as uniform chain pricing, the widespread use of salient price points, and the pre-tax distribution of prices influence the shifting of the tax.

Data

I use a proprietary dataset provided by the Federal Consumer Protection Agency in Mexico (PROFECO), which contains prices at the product-store-week level and comprehensive establishment information for 182 independent supermarkets belonging to 10 chains across the country in 18 out of 32 Mexican States through 2013 and 2014 .

I supplement this data with the Mexican Census of Economic Units for 2013 & 2014 (DENUE) to approximate local competition. Using geolocation information, I count the number of competing stores within a certain driving distance (10 km) and time (20 min) from stores for which price information is available. These metrics include all available information on roads, paths, and highways and also consider traffic and road conditions between two locations.
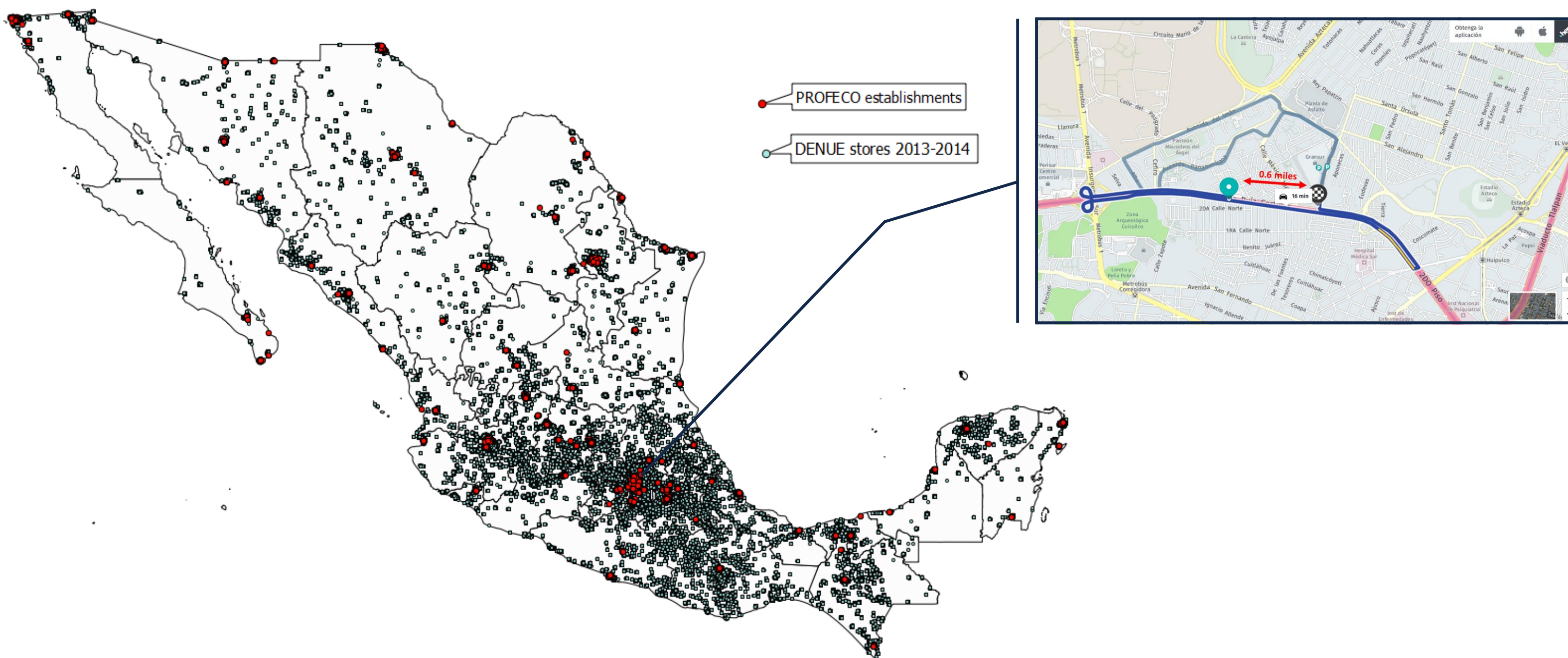

Figure 1. Geographical Distribution of PROFECO Supermarkets and Competing Establishments. The map shows supermarkets in the sample and gives an example of how the competition measurements used in this work were calculated.

Empirical Strategy

I estimate the effect of the tax into prices using a difference-in-differences regression.

$$P_{ijt} = \delta_i + \theta_j + \gamma_t + \beta * I_{\{Tax=1\}} * I_{\{t>Tax\}} + \varepsilon_{ijt} \qquad (1)$$

Where P_{ijt} is the per-liter price of product i in store j at time t (year-month), $I_{\{Tax=1\}}$ and $I_{\{t>Tax\}}$ are indicators identifying taxed products and after-tax periods, and δ_i, γ_t and θ_j represent brand-presentation (i.e., 1L. Coke), time, and establishment fixed effects, respectively.

The coefficient β captures the tax pass-through estimate; $\beta = 1$ implies perfect shifting, while $\beta \neq 1$ implies either over- or under-shifting and is identified by comparing taxed product prices before and after the tax and to prices of non-taxed products. I use non-taxed beverages sold at the same stores as a control group. Thus, the identifying assumption is that prices of taxable products would not have evolved differently from prices of non-taxed goods absent the tax.

To test whether the tax pass-through decreases as local competition rises, I add one term to (1):

$$P_{ijt} = \delta_i + \theta_j + \gamma_t + \beta_1 * I_{\{Tax=1\}} * I_{\{t>24\}} + \beta_2 * I_{\{Tax=1\}} * I_{\{t>Tax\}} * Comp_j + \varepsilon_{ijt} \qquad (2)$$

The variable $Comp_j$ captures the local competition (std.) faced by each store and the interaction $I_{\{Tax=1\}} * I_{\{t>Tax\}} * Comp_j$ captures whether stores facing larger local competitive pressures are less likely to over-shift the tax. The effect of interest is captured by β_2, its' sign and magnitude embody an empirical estimate of the effect of competition on the ability of establishments to shift the tax.

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Vars.	(1) DnD	(2) DD 10km	(3) DT 20min
Tax Effect	1.32***	1.32***	1.32***
	[0.020]	[0.020]	[0.020]
Tax*Competition	-	-0.04**	-0.04**
		[0.016]	[0.017]
Obs.	111,096	111,096	111,096
R-squared	0.338	0.338	0.338

Table 1. Tax Pass-through and Establishment Competition. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered at the establishment level. Columns 1-3 are estimated using as control group the prices of plain and sparkling water and untaxed sodas. Column 1 comes from Eq. (1) and columns 2-3 com form Eq. 2. DD refers to driving distance and DT refers to driving time.
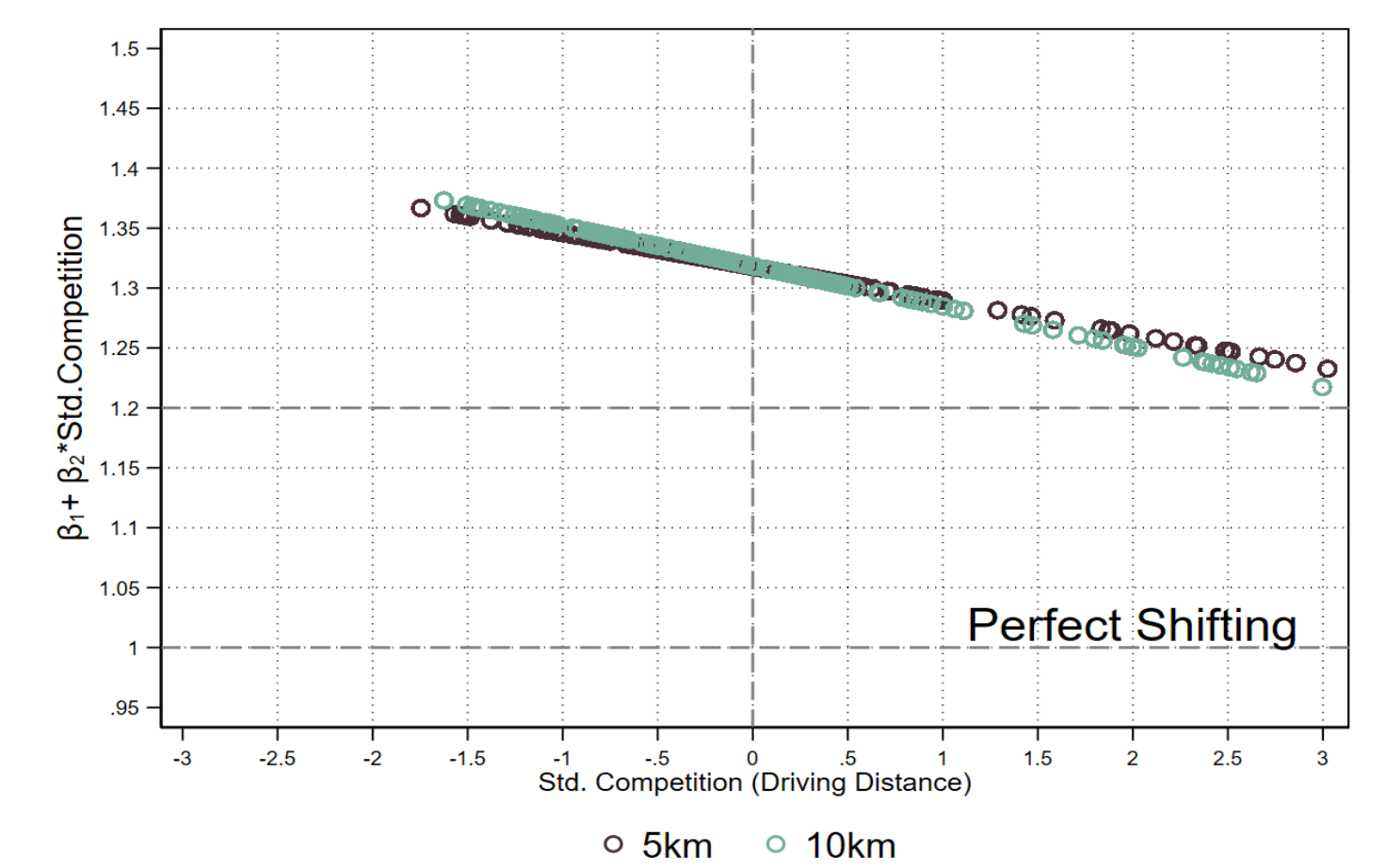

Figure 2. Tax Pass-through and Establishment Competition. The figure plots the predicted pass-through rates across establishments facing different levels of competition. Results for driving time are equivalent.

The effect of competition on the pass-through rate is negative and significant. However, competition alone cannot prevent over-shifting. I then turn to study how firms adjust prices to the tax. Specifically, how retailers use the tax to match competitors' prices, whether retail price points predetermine the shifting magnitude, and whether retail chains set high prices uniformly.
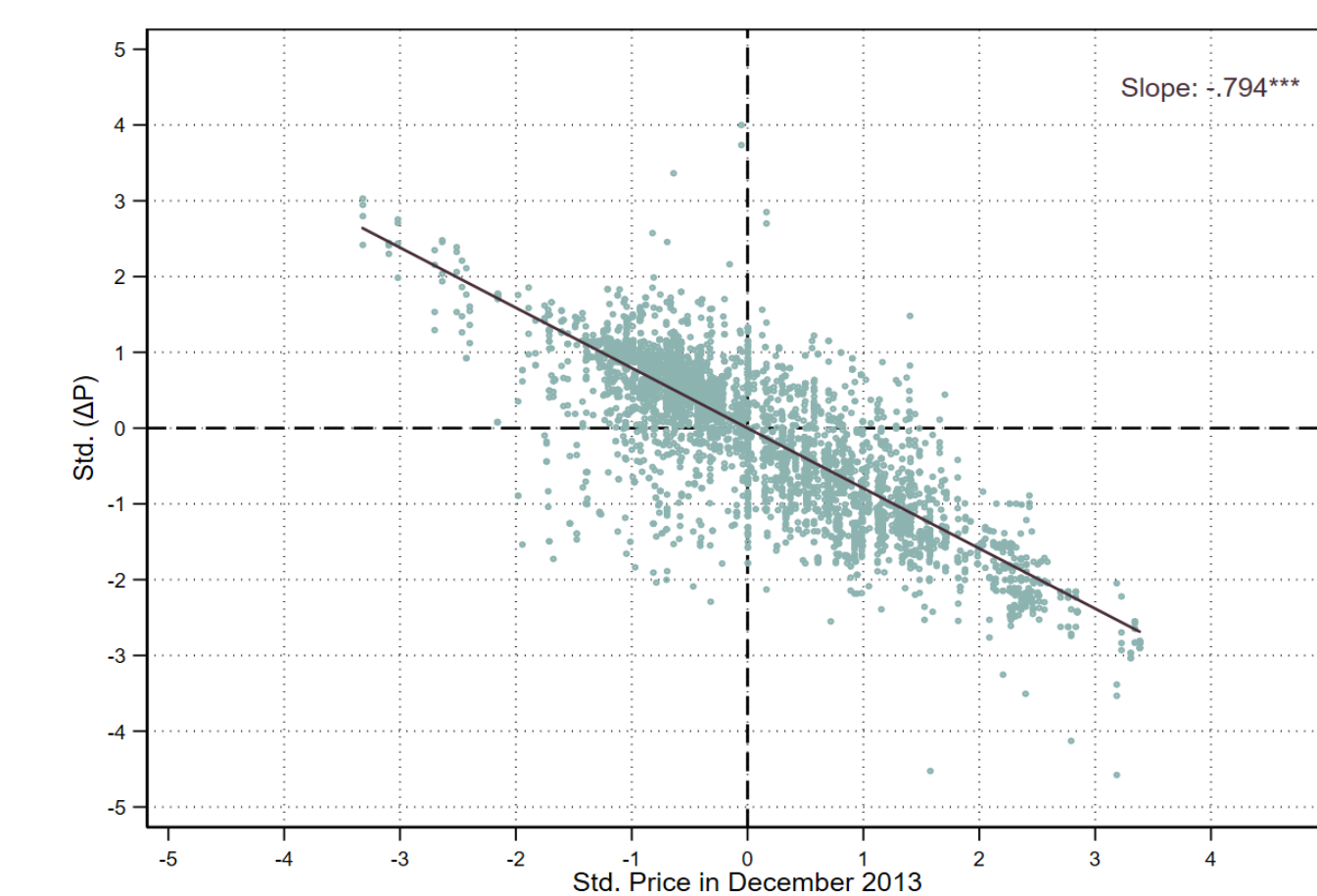
Pricing Like the Competition

Figure 3. Tax-Induced Adjustments and Pre-tax Prices. The figure takes prices of taxed items in December of 2013 as reference and plots price adjustments for January 2014 against the reference level. Each change is standardized at the month-product-state level. Items at relatively lower prices pre reform are likely to experience large price changes as response to the tax.
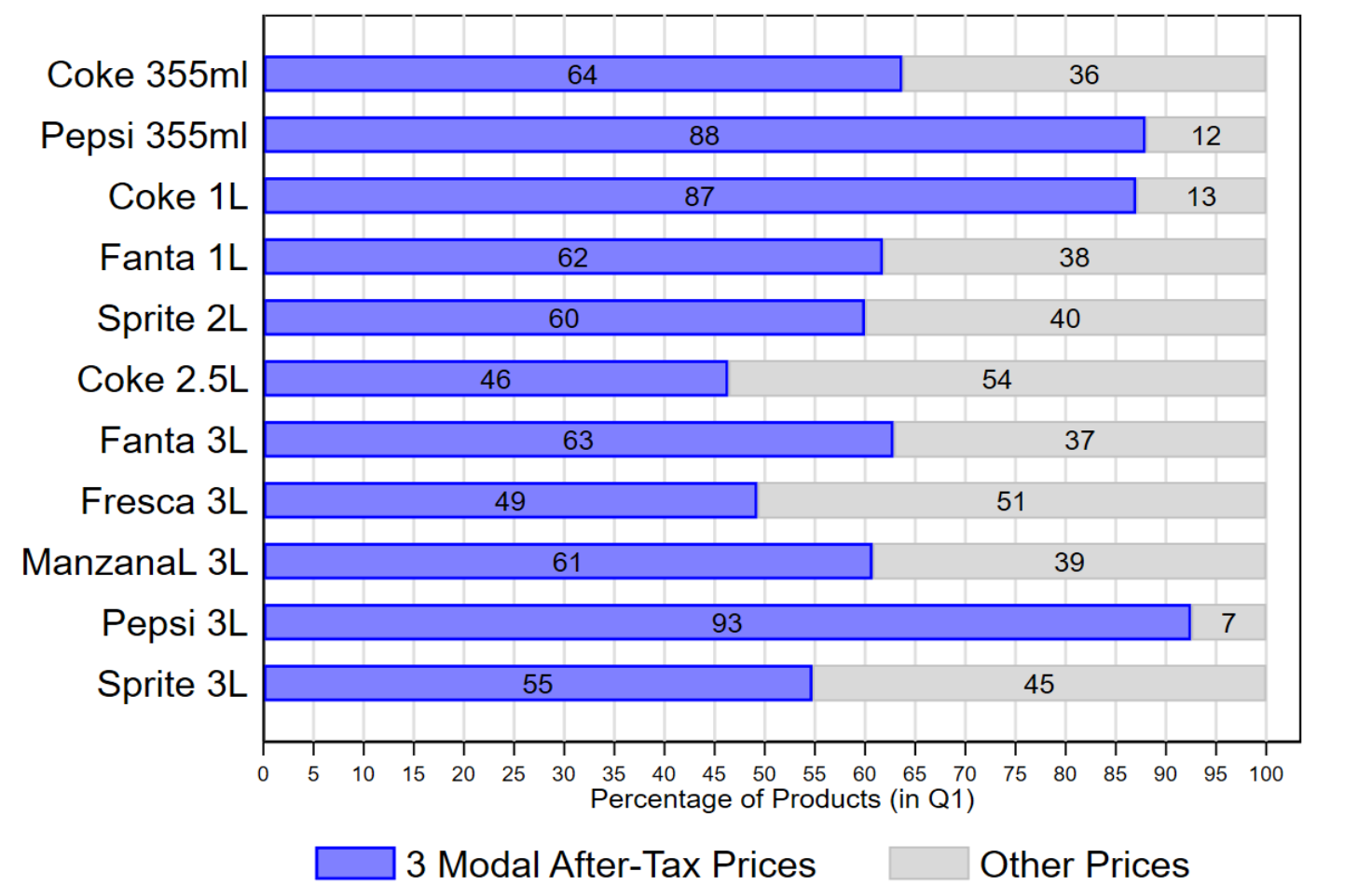

Figure 4. Tax-Induced Transitions by Product. The figure shows that large price increases are aimed at specific price points. Each bar shows the percentage of products using (spot on) one of the three most observed after-tax prices across stores. For example, 64% of the 355ml Coke used one of the three most used prices across establishments, as to shift the tax.
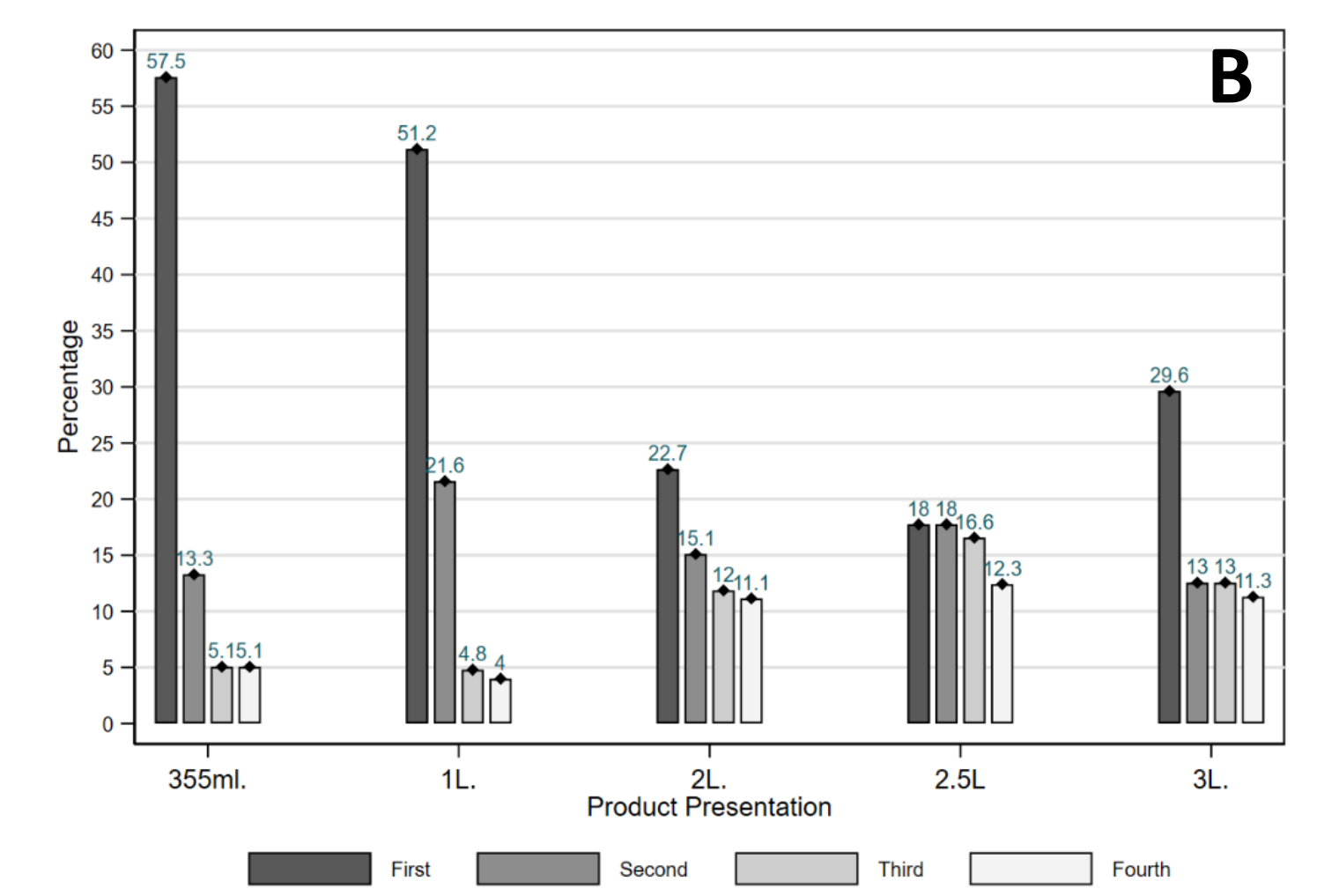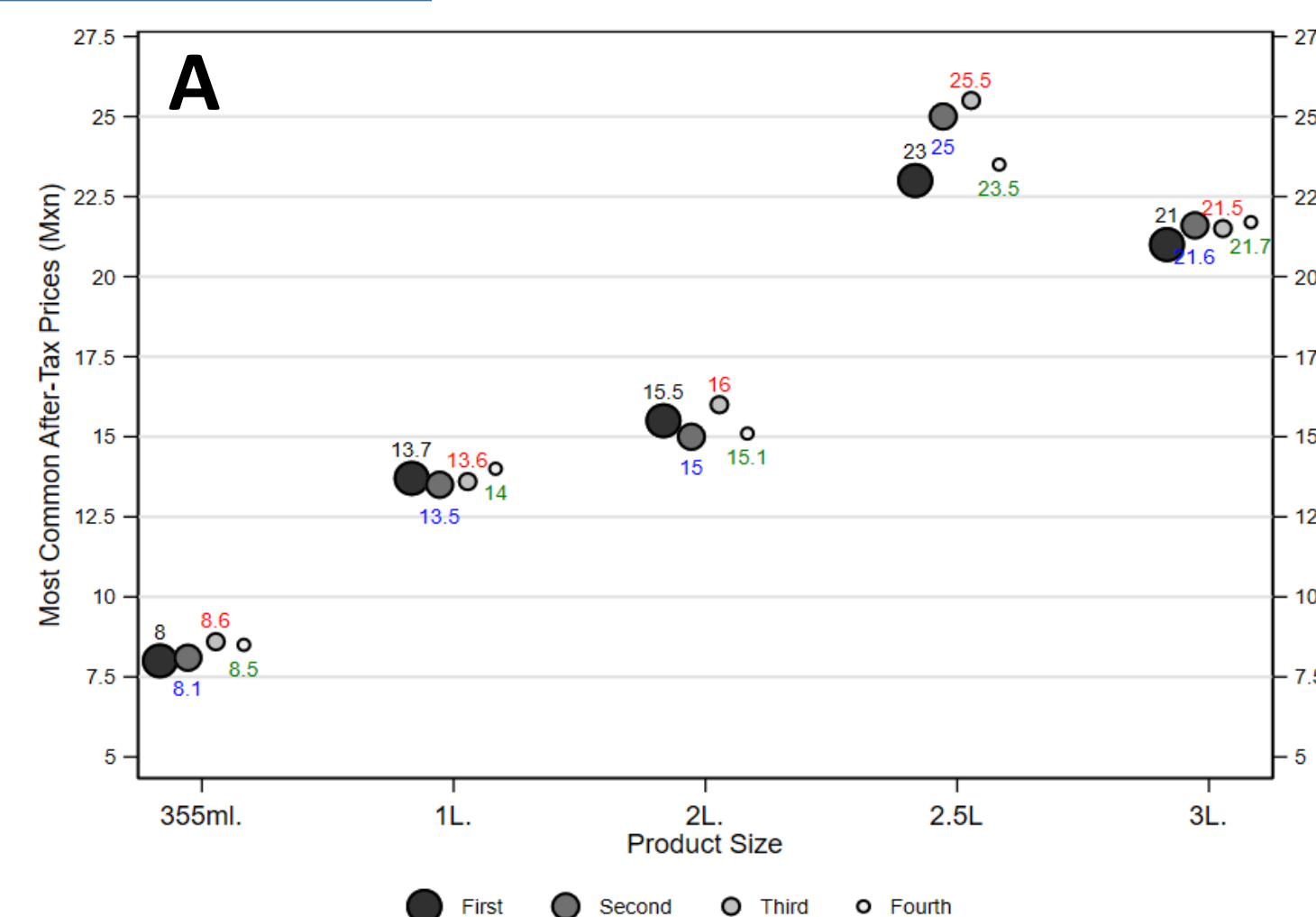
Price Points

Figure 5. Most Common After-Tax Prices by Product Presentation. The figure shows the most common after-tax prices (Jan 2014) at the presentation level (A) as well as the frequency of such adjustments in the data (B). For example, for 355ml products, the modal after-tax price is 8.00Mxn, followed by 8.10Mxn, 8.50Mxn and 8.60Mxn. The frequency of such after-tax prices is 57.5% for 8.00Mxn, 13.3% for 8.10Mxn, and 5.1% for 8.50Mxn and 8.60Mxn.
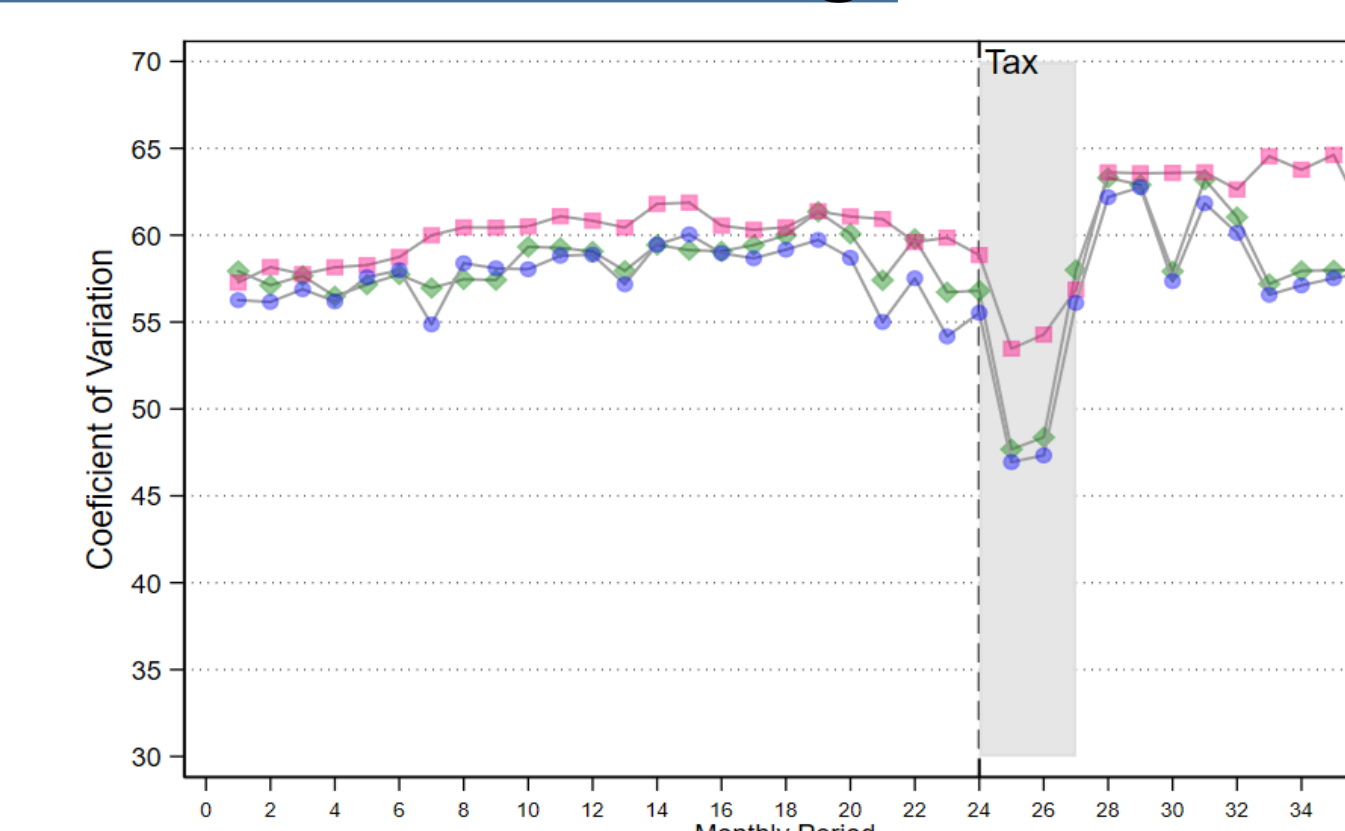
Uniform Chain Pricing

Figure 6. Price Dispersion in Three Supermarket Chains. The figure plots the monthly coefficient of variation of taxed-product prices for three chains capturing 60% of the stores in the sample. Before the tax, chains are stable in terms of price dispersion, but after the tax, a sudden drop occurs, evidence of prices having a chain component. Dispersion, however, also rose gradually after Jan 2014, suggesting further store level adjustments.
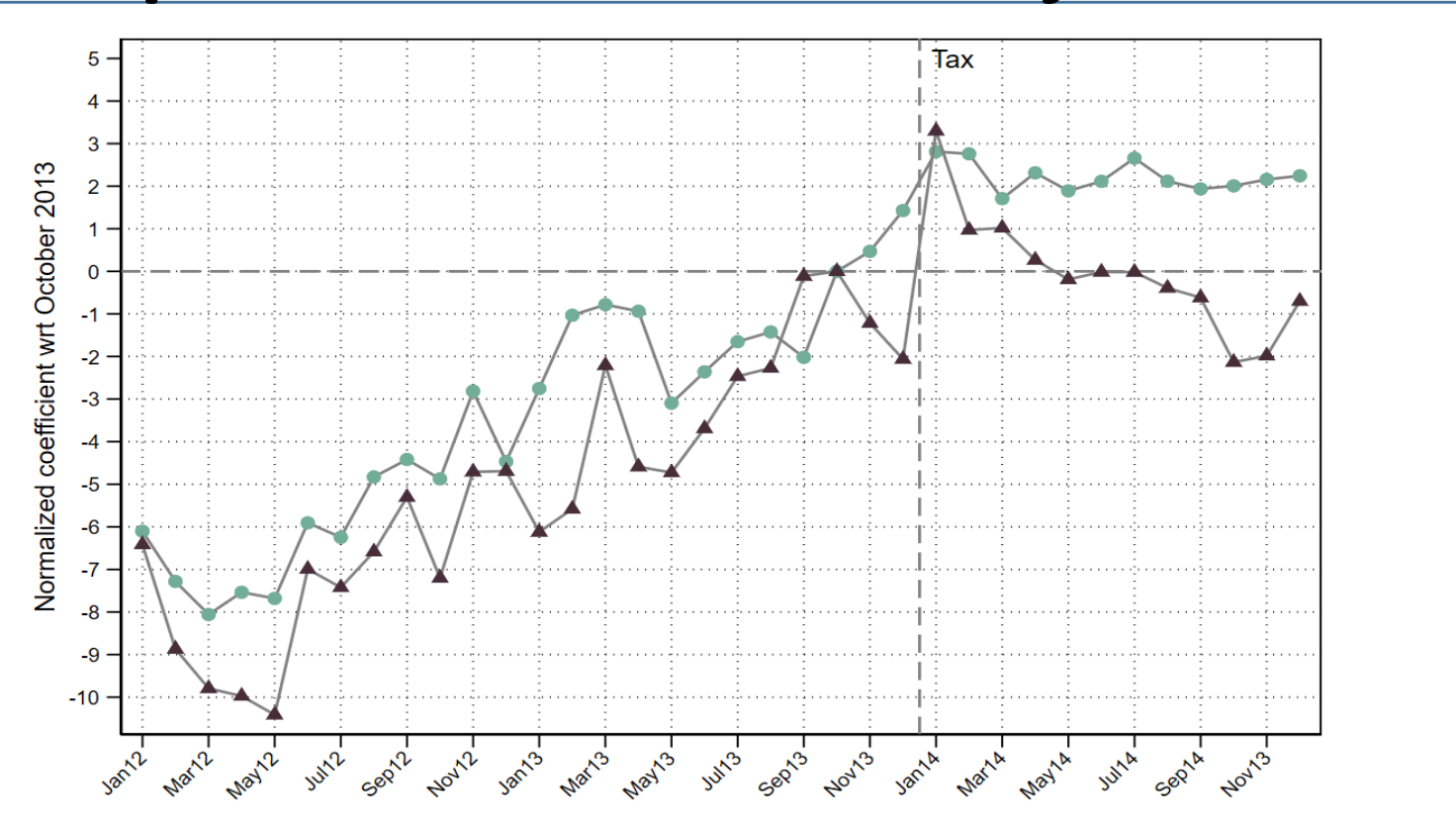
Competition & After-tax Adjustments

Figure 7. Discrete Pricing and Competition. The figure shows the avg. share of products priced at a customary price point in stores above and below the average level of competition across stores. First, stores below avg. maintain a higher share of their prices at customary price points over time. Second, stores use price points to shift the tax, regardless of competition. Third, stores facing above-average competitive pressures cannot maintain these customary prices for long.

Results and Conclusion

I study the 2014 SSB tax pass-through in Mexico. I show that the tax was over-shifted at an average rate of 32% and, consistent with the theory, supermarkets facing higher levels of competition were less likely to over-shift the tax.

However, competition is not enough to cancel over-shifting as retailers follow systematic pricing practices. Stores use a catch-up strategy to shift the tax which involves major adjustments to cheap goods and minor adjustments to expensive items, targeting a handful of post-tax modal prices, a scheme enabled by the use of discrete price points in the market.

These arguments appear conflicting: local competition affects individual pricing but few post-tax modal prices suggest centralized choices. To reconcile these arguments, I analyze prices at the chain level. I find that chains uniformly adjusted prices across stores, thereby increasing the frequency of some prices. However, contrary to a rigid uniform scheme, stores facing the highest competitive pressures adjusted prices down, indicating a mechanism for the negative relationship between competition and tax pass-through.

The key implication of these results is that the commonly used regression of prices on tax indicators is not entirely informative. This approach assumes that prices respond to taxes smoothly and that markets are regulated by standard-model criteria, such as competition. Conversely, pricing practices, shown to be large shifting determinants are often overlooked.