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Abstract

The finding of small price changes in many retail price datasets is often viewed as a puzzle. We show that a possible explanation for the presence of small price changes is related to sales volume, an observation that has been overlooked in the existing literature. Analyzing a large retail scanner price dataset that contains information on both prices and sales volume, we find that small price changes are more frequent when products' sales volume is high. This finding holds across product categories, within product categories, and for individual products. It is also robust to various sensitivity analyses such as measurement errors, the definition of "small" price changes, the inclusion of measures of price synchronization, the size of producers, the time horizon used to compute the average sales volume, the revenues, the competition, shoppers' characteristics, etc.

1. Introduction

Extensive empirical analyses of price-setting behavior using various micro-level price datasets show that individual prices tend to change at a significantly lower frequency than the corresponding market conditions.[1] A leading model offered to explain the sluggish response of prices to underlying shocks is the menu cost model, which posits that each time a firm changes a price, it incurs a lump sum cost that is independent of the size or the direction of the price change.[2]

A key prediction of the simple menu cost model is that firms make infrequent but relatively large price changes because making frequent small price changes is less economical (Caplin and Spulber 1987). However, empirical studies find that 20%–44% of the observed price changes are small, which many authors see as evidence against the simple menu cost model.[3]

To reconcile the existence of small price changes with menu costs, Dotsey et al. (1999) model stochastic menu costs, which lead to small price changes when the realized menu cost is small. Lach and Tsiddon (2007), Klenow and Malin (2011), Midrigan (2011), Alvarez and Lippi (2014) and Alvarez et al. (2016) suggest economies of scope in price adjustments, allowing both small and large price changes, as long as the average price change is larger than the menu cost.[4] Chakraborty et al. (2015), Rotemberg (1982), and Chen et al. (2008) suggest that consumer inattention can explain small price changes.

In this paper, which is primarily empirical, we use a large scanner retail price dataset with over 98 million weekly observations to show that sales volumes can be another explanation for small price changes. The empirical evidence we present suggests that small price changes are significantly more likely for products with high sales volumes than for products with low sales volumes. This result is robust. It holds across product categories, within product categories, or at the level of individual products across stores.

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[1] Examples include Carlton (1986), Cecchetti (1986), Lach and Tsiddon (1992, 1996, 2007), Kashyap (1995), Blinder et al. (1998), Slade (1998), Eden (2001, 2018), Dutta et al. (1999, 2002), Fisher and Konieczny (2000, 2006), Owen and Trzepacz (2002), Chevalier et al. (2003), Baharad and Eden (2004), Bils and Klenow (2004), Levy and Young (2004), Zbaracki et al. (2004), Álvarez et al. (2006), Dhyne et al. (2006), Knotek (2008, and forthcoming), Nakamura and Steinsson (2008), Campbell and Eden (2014), Kehoe and Midrigan (2015), Konieczny and Skrzypacz (2005, 2015), Gorodnichenko and Talavera (2017), Anderson et al. (2015, 2017), and studies cited therein. For older surveys, see Romer (1993), Weiss (1993), Taylor (1999), Willis (2003), and Wolman (2007). More recent surveys include Klenow and Malin (2011), Leahy (2011), and Nakamura and Steinsson (2013).

[2] See, for example, Barro (1972), Sheshinski and Weiss (1977 and 1992), Akerlof and Yellen (1985), Mankiw (1985), and Konieczny and Rumler (2006).

[3] See, for example, Bils and Klenow (2004), Nakamura and Steinsson (2008), Chen et al. (2008), Klenow and Kryvtsov (2008), Msidrigan (2011), Bhattarai and Schoenle (2014), Klenow and Malin (2011), and Gautier et al. (forthcoming).

[4] Alvarez et al. (2014), Eichenbaum et al. (2014), Cavallo and Rigobon (2016), and Cavallo (2018) suggest that many of the reported small price changes are due to measurement errors. Even these studies, however, find a non-negligible share of small price changes that cannot be explained by measurement errors.

It is also robust to various sensitivity analyses such as the definition of “small” price changes in relative vs. absolute terms, measurement errors, the time horizon used to compute the average sales volume, and the inclusion of controls for competition, markups, pricing zones, producers’ size, etc.

Sales volumes as an explanation for small price changes seem to have been overlooked by the existing literature, although it has a straightforward intuition. Under a menu cost (i.e., non-convex lump-sum price adjustment cost), the firm incurs the same price adjustment cost regardless of the number of units sold because it pays the menu cost once to change the price of all units sold. If it sells one unit, it will change the price only if the benefit from the change exceeds the menu cost. If it sells many units, the benefit from changing the price is accumulated across all units sold, while the menu cost is the same, which will likely make a small price change more profitable. Thus, comparing products that differ only in sales volume, we expect that products with higher sales volumes would have more price changes and that their price changes would be smaller, on average, than products with lower sales volumes. In the appendix, we show that the data is consistent with both predictions.

Particularly relevant to our work are Bhattarai and Schoenle (2014) and Kang and Usher (2023). Bhattarai and Schoenle (2014) use the BLS micro-level price data underlying the PPI to show that the average size of price changes is negatively correlated with the number of products offered by a producer. They also present evidence suggesting that producers that offer many products tend to have high sales volume.

We check if our results may be driven by large firms having higher sales volume or more price changes. We find that controlling for (a) the number of products offered by each producer, (b) the percentage of prices that change, and (c) the average size of all price changes (excluding the current price change), has little effect on the estimated coefficients of the sales volume.

Kang and Usher (2023) construct a model based on the assumption that the size of price changes is negatively correlated with the revenue and therefore, small price changes are possible if the revenue is sufficiently large. Because there is a strong correlation between sales volume and revenues (in our data, the average correlation is 0.85), our model and findings are consistent with their model and findings. Indeed, when we test the correlation between the likelihood of small changes and revenue, we find a positive and significant correlation. However, our empirical results further suggest that the positive correlation between revenue and small price changes is driven by the sales volume component of the revenue, and not by the price component.

Our results are likely to hold in other datasets as well. For example, the strong correlation between sales volume and revenue suggests that our results are likely to hold in Kang and Usher's (2023) data. In addition, although the Bhattarai and Schoenle (2014) data does not allow direct analysis of the correlation between small price changes and sales volume, the observation that our results hold along with their results, suggests that such a correlation exists in their data.

Further, our results suggest that a lack of correlation between the price gap and the likelihood of a price change, as reported by Karadi et al. (forthcoming), for example, is not necessarily evidence against selection. If the likelihood of a small price change depends on sales volumes, then retailers might select to adjust prices of products with high sales volumes even if the deviation of their price from the optimal price is small. Thus, even when selection is present, in the wake of a monetary shock we are likely to observe both large and small price changes.

We proceed as follows. To motivate our empirical analyses, in section 2, we extend Barro's (1972) model to derive a relationship between the width of the (*S*, *s*) band and the sales volume. In section 3, we discuss the data. In section 4, we present the empirical findings. In section 5, we discuss robustness. We conclude in section 6.

2. Sales volume and the width of the optimal (*S, s*) band

To motivate the empirical analyses of the relationship between sales volumes and the prevalence of small price changes, we extend Barro's (1972) model. Although the model is highly stylistic, it is useful because one criticism of the canonical menu cost model is that it fails to predict small price changes. We show that conditional on sales volume, even this highly stylistic model can predict small price changes.

Following Barro (1972), consider a profit-maximizing monopolist producing a homogenous good. The linear demand and the quadratic cost functions are given by $Y = \alpha - \beta P + u$ and $C(Y) = a + bY + cY^2$, respectively, where *u* is a symmetric demand disturbance/shifter, $C'(Y) > 0$, and $a, b, c, \alpha, \beta > 0$. The producer's maximization problem is thus given by:

$$\begin{cases} \max\left[PY - \left(a + bY + cY^2 \right) \right] \\ \text{s.t. } Y = \alpha - \beta P + u \end{cases} \tag{1}$$

Setting $MR = MC$, and solving for *P* and *Y*, we obtain

$$P^* = \left[\frac{\alpha + \beta\left(2c\alpha + b\right)}{2\beta\left(1 + c\beta\right)}\right] + \left[\frac{1 + 2c\beta}{2\beta\left(1 + c\beta\right)}\right]u \tag{2}$$

and

$$Y^* = \left[\frac{\alpha - \beta b}{2\left(1 + c\beta\right)}\right] + \left[\frac{1}{2\left(1 + c\beta\right)}\right]u \tag{3}$$

The second-order condition for a maximum is given by $1 + c\beta > 0$.

In the absence of a disturbance, i.e. if $u = 0$, the profit-maximizing output is given by

$$Y^*\big|_{u=0} = \frac{\alpha - \beta b}{2\left(1 + c\beta\right)} \tag{4}$$

where $\alpha - \beta b > 0$, which is required for the output to be positive in the disturbance-free equilibrium. We can think of $Y^*\big|_{u=0}$ as the expected output.

Following Barro (1972, p. 19), suppose that the value of the disturbance changes from 0 to *u*. Assuming that the firm continuously adjusts its price and output to the change in *u*, the resulting change in the firm's profit, as Barro shows, is given by

$$\begin{aligned}\Delta\pi_{(0,u)} &= \int_0^u \left(\frac{d\pi}{du}\right)du \\ &= \int_0^u \left[P - C'(Y)\right]du \\ &= \left[\frac{\alpha - \beta b}{2\beta\left(1 + c\beta\right)}\right]u + \left[\frac{1}{4\beta\left(1 + c\beta\right)}\right]u^2\end{aligned} \tag{5}$$

Next, assume that the firm's price is sticky, stuck at $\hat{P}$, which denotes the optimal price in the disturbance-free equilibrium, such that $d\hat{P}/du = 0$. Then, (2) implies that

$$\hat{P} = \frac{\alpha + \beta\left(2c\alpha + b\right)}{2\beta\left(1 + c\beta\right)} \tag{6}$$

We follow Barro (1972, p. 20) to assume that the disturbance is not "too small" or "too large", i.e., $u_{\min} \le u \le u_{\max}$. This is necessary to avoid the situations of no production, which will be the case if $u < u_{\min}$, or a shortage, which will be the case if $u > u_{\max}$. Then,

$$\begin{aligned}\Delta\hat{\pi}_{(0,u)} &= \int_0^u \left(\frac{d\hat{\pi}}{du}\right)du \\ &= \int_0^u \left[\hat{P} - C'(\hat{Y})\right]du \\ &= \left[\frac{\alpha - \beta b}{2\beta\left(1 + c\beta\right)}\right]u - cu^2\end{aligned} \tag{7}$$

The expression in (7) is the change in the profit when the disturbance value changes from

0 to *u*, but the firm does not adjust its price, i.e. when the price is stuck at $\hat{P}$.

The firm's profit gain, if it adjusts its price to the demand shock, is therefore given by

$$\Delta\pi_{(0,u)} - \Delta\hat{\pi}_{(0,u)} = \theta u^2 \tag{8}$$

where

$$\theta = \frac{(1+2c\beta)^2}{4\beta(1+c\beta)} > 0 \tag{9}$$

The expression in (8) can be interpreted as the loss the firm incurs for not adjusting its price in response to the demand shock. As Barro (1972, p. 20) notes, the symmetry of this loss means that what matters is the size of the demand shock, not its sign. It follows that the optimal price adjustment rule (*S*, *s*), is symmetric. Also, for a given disturbance *u*, the loss from not adjusting the price decreases with the price sensitivity of demand β, and increases with the slope of the marginal cost curve $C''(Y) = 2c$.

Barro's (1972) main conclusion is that if *u* follows a symmetric random walk, then the optimal (*S*, *s*) band is symmetric, given by $\left(\hat{h}, -\hat{h}\right)$, where

$$\hat{h} = \sqrt{\sigma}\left(\frac{6\gamma}{\theta}\right)^{0.25} \tag{10}$$

where γ is a fixed, lump-sum menu cost, σ^2 is the variance of the Bernoulli process driving the symmetric random walk, and θ is given by (9).[5]

According to (10), the higher the menu cost, the wider the band of inaction. On the other hand, a high θ implies a narrow band of inaction. That is because according to (8)–(9), a high θ means a greater profit loss from not adjusting the price.

In models with CES demand, the optimal value of the barrier $\hat{h}$ is independent of the output produced, because of the constant price elasticity assumption. Here, however, the demand is assumed linear and thus its price elasticity is not constant. We can therefore take advantage of this property by extending the model to derive the relationship between the optimal barrier, i.e., the optimal (*S*, *s*) band, and the output. Rewrite (9) as

$$\begin{aligned} \theta &= \frac{(1+2c\beta)^2}{4\beta(1+c\beta)} \\ &= \left[\frac{\alpha - \beta b}{2(1+c\beta)}\right]\left[\frac{(1+2c\beta)^2}{2\beta(\alpha-\beta b)}\right] \end{aligned} \tag{11}$$

[5] The expression for the barrier $\hat{h}$ as given above, is identical to the expression for the barrier that Dixit (1991, p. 144) derives and reports in his equation (11).

By (4), the term in the first brackets is the optimal level of output in the disturbance-free equilibrium $Y^*|_{u=0}$. Therefore, (11) can be written as a function of $Y^*|_{u=0}$,

$$\theta\left(Y^*|_{u=0}\right)=\left(Y^*|_{u=0}\right)\left[\frac{\left(1+2c\beta\right)^2}{2\beta\left(\alpha-\beta b\right)}\right] \tag{12}$$

which shows that $\theta=\theta\left(Y^*|_{u=0}\right)$, i.e., θ is a function of $Y^*|_{u=0}$.

To show the effect of changes in output $Y^*|_{u=0}$ on the frequency of small price changes, consider a change in β which by (4) affects the output $Y^*|_{u=0}$ because of its effect on the demand, while in parallel it also affects θ by (11). Note that from the first part of (11), it follows that

$$\begin{aligned}\frac{\partial\theta}{\partial\beta}&=\frac{\partial}{\partial\beta}\left[\frac{\left(1+2c\beta\right)^2}{4\beta\left(1+c\beta\right)}\right]\\&=-\frac{1+2c\beta}{4\beta^2\left(1+c\beta\right)^2}\\&<0\end{aligned} \tag{13}$$

while from (10) it follows that

$$\begin{aligned}\frac{\partial\hat{h}}{\partial\theta}&=\frac{\partial}{\partial\theta}\left[\sqrt{\sigma}\left(\frac{6\gamma}{\theta}\right)^{\frac{1}{4}}\right]\\&=-\frac{\sqrt{\sigma}\left(6\gamma\right)^{\frac{1}{4}}}{4\theta^{\frac{5}{4}}}\\&<0\end{aligned} \tag{14}$$

Now consider a situation where there is an increase in demand because of a decrease in β, which leads to higher $Y^*|_{u=0}$ because, using (4), we have

$$\begin{aligned}\frac{\partial\left(Y^*|_{u=0}\right)}{\partial\beta}&=\frac{\partial}{\partial\beta}\left[\frac{\alpha-\beta b}{2(1+c\beta)}\right]\\&=-\frac{(\alpha c+b)}{2(c\beta+1)^2}\\&<0\end{aligned} \tag{15}$$

Then, the decrease in β which by (15) increases $Y^*|_{u=0}$, increases θ by (13), which by (14) decreases $\hat{h}$, making the (s, S) band narrower.

Another way to see this, is to find directly the sign of the partial derivative of $\hat{h}$ with respect to β, by first substituting (9) in (10). Then we obtain the partial derivative

$$\frac{\partial\hat{h}}{\partial\beta}=\frac{\partial}{\partial\beta}\left[\sqrt{\sigma}\left(\frac{6\gamma}{\theta}\right)^{\frac{1}{4}}\right]$$

$$=\frac{\partial}{\partial\beta}\left[\sqrt{\sigma}\left\{\frac{6\gamma}{\left[\frac{(1+2c\beta)^2}{4\beta(1+c\beta)}\right]}\right\}^{\frac{1}{4}}\right]$$

$$=\frac{\sqrt[4]{\frac{3}{2}}\left(\frac{c\gamma\beta}{(1+2c\beta)^2}-\frac{4c\gamma\beta(1+c\beta)}{(1+2c\beta)^3}+\frac{\gamma(1+c\beta)}{(1+2c\beta)^2}\right)\sqrt{\sigma}}{2\left[\frac{\gamma\beta(1+c\beta)}{(1+2c\beta)^2}\right]^{\frac{3}{4}}} \tag{16}$$

$$=\frac{\sqrt[4]{\frac{3}{2}}\,\gamma\sqrt{\sigma}}{2(1+2c\beta)^3\left[\frac{\gamma\beta(1+c\beta)}{(1+2c\beta)^2}\right]^{\frac{3}{4}}}$$

$$>0$$

The expressions in (13)–(15), or alternatively (15)–(16), constitute our main analytical result. Consider, for example, a situation where there is an increase in demand because of a decrease in β. Then, according to (15), output will increase. But according to (16), the decrease in β will reduce $\hat{h}$, leading to a narrower optimal (*S*, *s*) band. In other words, there is an inverse relationship between the level of output (as determined by the demand) and the width of the (*S*, *s*) band. If the output of the monopolist is high (low), then the (*S*, *s*) band will be narrower (wider), which means that we will see more (less) frequent smaller price changes. Trivially, this will be true for small menu costs. However, our result is independent of the size of the menu cost. That is, the model predicts that we will likely see small price changes even if the menu cost is large.

Another implication of the reduction in the width of the (*S*, *s*) band is that as the sales volume increases, the frequency of price changes, irrespective of their size, should also increase. We test this second prediction in Appendix O, in the Online Supplementary

Appendix, and find that it is supported by the data.

3. Data

We use data from Dominick's, a large US retail food chain with 93 stores in the greater Chicago area with a market share of 25%. The data contain more than 98 million weekly observations over 8 years, from September 14, 1989, to May 8, 1997, for 13,504 products in 29 categories, including food, cleaning products, hygienic products, and pharmaceutical products.[6] Each weekly observation includes the retail price, the number of units sold, the revenue, the retailer's markup, and some product attributes. These features make Dominick's dataset especially well-suited for our analysis.

An important attribute of Dominick's data is that its prices were set on a weekly basis. Thus, each week there was one price. If manufacturer coupons were used, we cannot account for these. During the sample period, however, the use of such coupons was limited (Barsky et al. 2003, Chen et al. 2008, Levy et al. 2010 and 2011).

4. Empirical findings

4a. Results of pooled analysis

To study the correlation between sales volumes and small price changes, we follow Chen et al. (2008) to define a small price change as a price change of 10¢ or less. We choose to focus on the absolute rather than the relative size of price changes because our hypothesis implies that a price change of a given size is profitable if the change in cents multiplied by the sales volume is greater than the menu cost. For example, a change of 1 cent in a price adds 1 cent to the revenue if the firm sells 1 unit and $10 if the firm sells 1,000 units, irrespective of the price prior to the change. For our purpose, therefore, it makes sense to define small price changes in cents. In addition, a "unit" in our data may be composed of multiple units, e.g., a six-pack of beer. In such cases, we count each pack as a single unit, because the consumer pays once for the entire pack.

In the appendix, we show that our results hold (and are even stronger), if we exclude multi-units packs. In the appendix, we also show that our findings are robust to alternative definitions of small price changes, including 5¢, 15¢, 2%, and 5%, as well as relative to the average product-level price change (Midrigan 2011, and Bhattarai and Schoenle 2014). Thus, although we focus here on absolute price changes, the results also

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[6] Dominick's data contains observations on 18,035 UPCs. However, some of the UPCs are re-launches of the same product. See Mehrhoff (2018), and Dominick's Data Manual (p. 9), available at https://www.chicagobooth.edu/-/media/enterprise/centers/kilts/datasets/dominicks-dataset/dominicks-manual-and-codebook_kiltscenter.aspx.

apply to relative price changes, as in Alvarez et al. (2016).

Another possible source of noise in our data is measurement errors (Alvarez et al., 2016). As Eichenbaum et al. (2014) note, prices reported in scanner datasets are weekly average prices. This can result in spurious small price changes when shoppers pay different prices, for example when some shoppers use coupons.[7] To control for this, we use observations on price changes only if the post-change price lasted for at least two consecutive weeks. As noted by Strulov-Shlain (2023), the likelihood that a spurious price change would persist for more than one week is very low. In the appendix, we report the results of two other robustness tests. In the first, we exclude observations where price changes are ≤ 2¢ (Alvarez et al., 2016). In the second, we exclude observations where Dominick's dataset indicates that coupons were used.

As a first test of the correlation between small price changes and sales volumes, we merge the observations in all 29 categories. Across all categories, 26.6% of all price changes are small (i.e., smaller, or equal to 10¢), and the average sales volume is 10.0 units per week. We then divide product-stores into deciles according to their sales volume. Figure 1 depicts the results. An increase in the sales volume is associated with a significant increase in the percentage of small price changes. The percentage of small price changes in the 10th decile, 33.36%, is 2.4 times higher than the percentage of small price changes in the 1st decile, 13.89%.

As a formal test, we estimate the following fixed effect regression model using the pooled data:

$$small\ price\ change_{i,s,t} = \alpha + \beta ln\left(average\ sales\ volume_{i,s}\right) + \gamma X_{i,s,t} + month_t + year_t + \kappa_i + \delta_s + \mu_i + u_{i,s,t} \quad (17)$$

where small price change is a dummy that equals 1 if a price change of product *i* in store *s* in week *t* is less or equal to 10¢, and 0 otherwise. The average sales volume is for product *i* in store *s* over the sample period.[8] By taking the average over a long period, we obtain an estimate of the expected sales volume that does not depend on transitory shocks

[7] Consider the following example. In week *t*, the price of a good was $1.99 and all units were sold at the posted price. In week *t*+1, the posted price remained $1.99. 9 consumers bought at the posted price, and one used a coupon and paid 1.79. The price that would be recorded in the scanner dataset is $1.97, i.e, a 2 cents change relative to week *t*.

[8] In calculating the average sales volume, we need to account for missing observations, because a missing observation in week *t* implies that the product was either out of stock or had 0 sales on that week. Thus, averaging over the available observations can lead to an upward bias for products that are sold in small numbers. Therefore, for each product in each store, we calculate the average by first determining the total number of units sold over all available observations. We then identify the first and last week for which we have observations, and calculate the average for each product-store as $\frac{total\ no.\ of\ units\ sold}{last\ week - first\ week}$. The resulting figure is smaller than we would obtain if we averaged over all available observations (which would not include obsservations on weeks with 0 sales).

or sales. **X** is a matrix of other control variables. Month and year are fixed effects for the month (to control for seasonality) and the year of the price change. To control for the differences across stores and products, we add κ, δ and μ which are fixed effects for categories, stores and products, respectively. u is an i.i.d error term.

Table 1 reports the estimates of the coefficients of the key variable, average sales volume. Column 1 reports the results of a baseline regression that includes only the average sales volume and fixed effects for months, years, stores, and products. The coefficient of the sales volume is 0.026, and it is statistically significant. This result suggests that a 1% increase in the sales volume is associated with a 2.6 percentage points increase in the likelihood of a small price change. In column 2, the matrix **X** includes the following control variables: the log of the average price, to control for the price level effect on the size of price changes, the percentage change in the wholesale price, and control for sale- and bounce-back prices. The latter is important as price changes associated with sales tend to be large (Nakamura and Steinsson 2008).[9]

The coefficient of the sales volume remains positive and statistically significant. Its value is 0.017, suggesting that a 1% increase in the sales volume is associated with a 1.7 percentage points increase in the likelihood of a small price change.

In column 3, we add a dummy for 9-ending prices as an additional control because when the pre-change price is 9-ending, price changes tend to be larger than when the pre-change price ends in other digits (Levy et al. 2020). Thus, if products with high sales volume tend to have non-9-ending prices, then it might lead to small changes in their prices. This has only a marginal effect on the coefficient; its value remains 0.017 and statistically significant.

In column 4, we keep the same control variables as in column 3, but we focus on regular prices by excluding the sale- and bounce-back prices. We do this for two reasons. First, sale- and bounce-back prices tend to be large, and therefore, we need to account for them properly. Second, it is often argued that changes in sale prices have smaller effect on inflation than changes in regular prices (Nakamura and Steinsson 2008, Midrigan 2011, Anderson et al. 2017, Ray et al. 2023).

We find that the estimate of the coefficient of the sales volume is 0.033, and is statistically significant. The pooled results, therefore, suggest that there is a positive and

[9] To identify sale prices, we do not use the sales' flag included in the Dominick's data because it was not set on a consistent basis (Peltzman 2000). Instead, we use the sales filter algorithm of Fox and Syed (2016) to identify sales. This algorithm has the advantage that it was calibrated using Dominick's data and, consequently, it is particularly useful for identifying sales in the Dominick's data.

statistically significant correlation between small price changes and sales volumes.

4b. Results of category-level analyses

Estimation using pooled data can hide large differences across categories. Therefore, we study the category-level correlation between small price changes and sales volumes.

As a first test, for each category, we group the products into high, medium, and low sales volume products, according to the average sales volumes over the sample period. Low sales volume products are products with average sales volume in the bottom third of the distribution, high sales volume products have sales volume in the top third of the distribution, and medium sales volume products have sales volume in between.

Figure 2 shows, for every category, the frequency of price changes for each size of price change from 1¢ to 50¢. The red dashed line depicts the frequency of price changes for high sales volume products, the black dotted line depicts the frequency of price changes for medium sales volume products, and the blue solid line depicts the frequency of price changes for low sales volume products. The shaded area marks the range of small price changes, $\Delta P \leq 10¢$.

The figure shows that the most common price changes are multiples of 10¢ (as reported also by Chen et al. 2008 and Levy et al. 2011). It can also be observed that in all categories except cigarettes (which are highly regulated), price changes are far more common among high sales volume products than among low sales volume products.

Focusing on the shaded area, we see that the frequency of small price changes is in general far greater among the high sales volume products than among low sales volume products. Indeed, for high sales volume products, in most categories, the frequency of small price changes exceeds the frequency of large price changes. This is less common, and less dramatic, among low sales volume products. For the medium sales volume products, the frequency of price changes, and the frequency of *small* price changes in particular, fall in between the frequencies of the low and high sales-volume products.

As a formal test, we estimate a series of category-level fixed-effect regressions, similar to (17). The only difference is that we now exclude the category fixed effects. Table 2 reports the coefficients of the key variable, average sales volume, for each product category. Column 1 reports the results of baseline regressions that exclude the **X** matrix. I.e, the regressions include only the average sales volume and fixed effects for months, years, stores, and products.

We find that in all 29 product categories, the coefficients are positive, and 27 are statistically significant. One more is marginally significant. In other words, in 28 of 29 product categories, there is a positive and statistically significant correlation between the likelihood that a price change is small and the average sales volume. The effect is economically significant. The average coefficient is 0.026, suggesting that an increase of 1% in the sales volume is associated with an increase of 2.6 percentage points in the likelihood that a price change will be small.

In column 2, we add the **X** matrix which includes the following control variables: the log of the average price to control for the price level effect, the percentage change in the wholesale price, and control for sale- and bounce-back prices, all as defined above. The results are similar to column 1. The coefficients of the average sales volume are positive and statistically significant in 27 categories, and marginally significant in 2 more. The average coefficient is 0.019. Thus, even after including the controls, we still find that increasing the average sales volume by 1% is associated with an increase of 1.9 percentage points in the likelihood of a small price change.

In column 3, we add a dummy for 9-ending prices as an additional control. Adding this dummy does not change the main result appreciably. All 29 coefficients remain positive. 27 are statistically significant, and 2 more marginally significant. Controlling for 9-ending prices, increasing the average sales volume by 1% is associated with a 2.0 percentage points increase in the likelihood of a small price change, on average.

In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We find that all the coefficients remain positive. 27 are statistically significant, and 1 more is marginally significant. The average coefficient is 0.038, implying that for regular prices, an increase of 1% in the average sales volume is associated with an increase of 3.8 percentage points in the likelihood of a small price change.

4c. Results of product-level analyses

A possible explanation for the correlation between sales volume and small price changes is that products with high sales volume have some unobserved attributes that make them prone to small price changes. We explore this possibility by estimating for each product a separate regression. If the correlation between sales volume and small price changes is found at the level of individual products, then it cannot be explained by unobserved attributes, since in each regression we have data on only one product.

Before presenting the full regression results, consider as an example the bathroom tissue category. In Figure 3, we show a scatter plot for each one of the 13 bathroom-tissue products that have data for all 93 stores at Dominick's. In each of the 13 panels, there are 93 dots, one for each store. In each figure, the *x*-axis in the figures gives the average weekly sales volume of the product in a store, and the *y*-axis gives the share of small price changes of the product in a store. The straight lines are regression lines.

According to the plots, the correlation between sales volume and the share of small price changes is positive for 11 of the 13 individual products. None of the negative correlations is statistically significant, while 8 of the 11 positive correlations (marked with solid black regression lines) are statistically significant. The regression lines that are not statistically significant are marked with red dotted lines.

For a more formal analysis, we calculate for each product in each of the 29 product categories the average weekly sales volume and the share of small price changes in each of the stores it was offered. Many products in the sample were offered for only short periods or only in a small number of stores. To avoid biases, we drop products for which we do not have information for at least 30 stores.

Using these data, we estimate for each product in each category an OLS regression with robust standard errors. The dependent variable is the share of small price changes for the product in each store. The independent variable is the average sales volume of the product in each store. The estimation results are summarized in Table 3.[10]

Column 1 gives, for each product category, the average of the estimated coefficients. Columns 2–5 give information on the sign of the estimated coefficients: the total number of coefficients, the % of positive coefficients, the total number of coefficients that are statistically significant at the 5% level, and the % of coefficients that are both positive and statistically significant at the 5% level.

According to the figures in the table, the average coefficients are positive in 28 of the 29 product categories. The only exception is the highly regulated cigarettes category, which is often excluded from the analyses (Chen et al. 2008, p. 729, footnote 2). In addition, the number of positive coefficients far exceeds the number of negative coefficients. On average, the former is 3.2 times larger than the latter. Ignoring the cigarettes category, more than 74.5% of the coefficients are positive.

Focusing on statistically significant coefficients, we find a far greater number of positive coefficients than negative coefficients that are significant. Except for the cigarettes category, in all categories, 81.40%–100% of the statistically significant coefficients are positive. In other words, for the overwhelming majority of the individual products in our sample, we find a positive relationship between sales volume and the

[10] For robustness, we have also conducted an analysis using LPM regressions, as in the previous section. See the discussion in Online Supplementary Web Appendix F.

share of small price changes.

To summarize, we find that the correlation between sales volume and the share of small price changes is positive whether we look across categories, within categories, and for individual products across stores. It seems unlikely, therefore, that the correlation is due to unobserved characteristics of the products or the product categories.

4d. Sales volume versus revenue

Kang and Usher (2023) find that the size of price changes is negatively correlated with the revenue. In column 1 of Table 4, we report the Pearson correlation coefficient between the average sales volume and the average revenue for product-stores for each product category. The average correlation is 0.85, suggesting that at the category level, the correlation is very strong.

In column 2, we replicate one of Kang and Usher's (2023) key findings by reporting for each product category, the coefficient estimates of regression (16) where we replace the log of the average sales volume with the log of the average revenue. The controls include fixed effects for months, years, stores, and products. The estimated coefficients are positive for all 29 product categories, and 28 of these are statistically significant. We thus confirm that Kang and Usher's (2023) findings hold in our data: there is a strong positive correlation between revenue and the likelihood of a small price change.

Revenue, however, is a product of the sales volume and the price. Our hypothesis implies that the revenue is correlated with the likelihood of a small price change via the sales volume, rather than via the price. To test this, in columns 3 and 4, we show the results of regressions that include both the sales volume and the revenue as independent variables. Once we add the sales volume to the regression, the coefficients of the revenue turn negative in 22 of the 29 categories. The coefficients of the sales volume, on the other hand, are positive in 23 of the 29 categories.

These results suggest that holding the sales volume constant, the higher the price level, the less frequent small price changes are. In other words, the positive correlation between revenues and the frequency of small price changes seems to materialize through the sales volume and not through the price.

4e. Sales volume, producer size, and price synchronization

According to Lach and Tsiddon (2007), Midrigan (2011), Alvarez and Lippi (2014), Letterie and Nilsen (2014), and Alvarez et al. (2016), small price changes can be explained by economies of scale in price adjustment, which makes small price changes profitable if the average price change exceeds the menu cost. Lach and Tsiddon (2007) and Bhattarai and Schoenle (2014) show that: (a) producers offering a large number of products are more likely to make small price changes than producers offering a small number of products, (b) small price changes are more likely when price changes are more synchronized, and (c) small price changes are more likely when the average size of all other contemporaneous price changes is high. In addition, Bhattarai and Schoenle (2014) provide evidence suggesting that producers offering more products are more likely to have a large sales volume. It is therefore of interest to examine whether our results hold when accounting for economies of scope by adding controls for price changes synchronization and the number of products per producer.

In column 1 of Table 5, we report the coefficients of the log of sales volume in regression (17), where we also include the average number of products per category offered by the same producer, as a proxy to the producer's size.[11] The regression also includes fixed effects for months, years, stores, and products. We find that all coefficients of the sales volume are positive and 27 are statistically significant. In addition, the coefficients of the sales volume are almost unaffected in comparison to the figures we report in column 1 of Table 3. Thus, it appears that the effects of sales volume on the likelihood of small price changes are unrelated to the effects of the size of the producers.

In column 2, we add a control for the percentage of the products that changed the price in the same week, excluding the current observation. Again, the coefficients remain almost unchanged in comparison to the figures we report in column 1 of Table 3.

In column 3, we further add the average size of contemporaneous price changes, excluding the current observation. Lach and Tsiddon (2007) show that when price changes are synchronized, a small price change is correlated with a large average contemporaneous price change. However, we find that adding the average size of price changes has little effect on the size of the coefficients of the sales volume. Also in this specification, 27 of the 29 coefficients are statistically significant.

Finally, in column 4, we add the percentage of the products that are produced by the same producer and changed price in the same week, excluding the current observation. This forces us to drop some observations because we can only use an observation if the producer offers at least two products on the relevant week. The upshot is that most of the remaining observations are of products produced by relatively large producers which are

[11] To calculate the average number of products offered by a producer, we follow Bhattarai and Schoenle (2014), by first determining the nubmer of products offered by a producer each week, and then averaging over all weeks.

most likely to make small price changes (Bhattarai and Schoenle 2014).

Therefore, if our results are driven by the size of the producers rather than by the sales volume, then focusing on large producers should lead to a substantial drop in the coefficients of the sales volume. We find, however, that the results do not change significantly. All the coefficients are positive, 27 of the 29 of them are statistically significant, and 2 more are marginally significant.

As another test, we follow Bonomo et al. (2022). They show that a large share of price changes takes place on "peak days." We therefore follow their methodology and create a dummy for peak days and then add it as a control to the regressions. The estimation results, which we present and discuss in Online Supplementary Web Appendix P, show that the correlation between sales volumes and small price changes holds also when we control for peak days.

5. Robustness

To assess the robustness of our findings, we conducted 19 sets of robustness tests:

1) ***<u>Measurement errors</u>***: Eichenbaum et al. (2014) conclude that prices based on scanner data might include spurious small price changes. We mitigate this concern by focusing only on price changes in which the post change price remained unchanged for at least 2 weeks. As further tests, we exclude all 1¢ and 2¢ price changes (Eichenbaum et al. 2014), and remove observations on price changes if Dominick's sale flag indicates that there was a coupon use because if some consumers used coupons, this could result in measurement errors (Eichenbaum et al. 2014). We also estimate the regressions using observations on all price changes, conditional on observing the prices in weeks *t* and *t*+1.
2) ***<u>Definition of small price changes</u>***: We define a small price change as a price change of 5¢ or less, and 15¢ or less. Because the size of price changes may be larger for more expensive products, we re-run the analyses by defining a small price change in percent as a price change of 2% or less, and 5% or less. Following Midrigan (2011) and Bhattarai and Schoenle (2014), we also define small price changes relative to the average price change at the store-product level. I.e., a price change is small if it is smaller or equal to $\kappa\left|\overline{\Delta p}_{i,s}\right|$, where $\overline{\Delta p}_{i,s}$ is the average price change for product i in store s, and κ attains the values (8) 0.50, (9) 0.33, (10) 0.25 and (11) 0.10.
3) ***<u>Time horizon for computing the average sales volume</u>***: Above, we use the average sales volume over the entire period, which can be thought of as a proxy for the

expected sales volume that is based on 8 years of data. However, this implicitly assumes that in the first years, the retailer can predict the future sales volume. An alternative is that the retailer makes decisions based on recent sales data. We, therefore repeat the analyses by calculating the average sales volume based on a rolling 52-week window of past observations.

4) ***Competition effect***: As another control for the effect of competition, we add control for Dominick's pricing zones. We re-estimate the product-level regressions by augmenting the data with demographic information of the consumers that live in the proximity of each store, including their median income, the share of minorities, and the share of unemployed.
5) ***Controlling for revenue***: In section 4d, we estimate regressions with both the sales volume and the revenue at the category level. For robustness, we explore the effect of adding further controls. In addition, at the category level, the high correlation between the sales volume and the revenue may render the results suspect. Therefore, we pool data from all categories together and re-estimate the regressions. We also test an alternative definition of the average revenue, defining it as the product of the average sales volume and the average price for estimating category-level regressions.
6) ***Controlling for the producers' size***: In section 4e, we calculate the number of products offered by each producer at the category level. To test that the results do not change for firms of different sizes, we follow Bhattarai and Schoenle (2014) in dividing producers into bins according to the number of products they offer in each category and estimate the correlation between sales volume and small price changes for each bin separately. In addition, it is possible that producers that offer products in more than one category synchronize price changes across categories, We, therefore, pool the data together and repeat the analysis.
7) ***Controlling for profit margins***: Some products have high sales volumes, yet they have few, if any, small price changes. One example is iPhones, which have high sales volumes, yet most of their price changes are large. A possible explanation is that small price changes are less likely for products with large markups because large markups imply that small price changes have, in percentage terms, only a small effect on total profits. We, therefore, add Dominick's measure of markups to the category-level regressions as a further control variable.
8) ***Graphic illustration of the category-level correlation between small price changes and sales volume***: We include a figure similar to Figure 1, which shows that small

price changes are correlated with high sales volume at the category level as well as at the aggregate level.

9) ***Reproduce Figure 2 using % price changes****:* In Figure 2, the most common price changes are multiples of 10 cents. This is consistent with a large literature on price points (Levy et al., 2011, 2020). However, because price changes that are multiples of 10 cents might be large for some products, we reproduce Figure 2 using the size of price changes in % terms rather than in cents.

10) ***National brands vs. private labels***: A possible explanation for our results is that the correlation between sales volume and small price changes is an artifact of differences in demand. We, therefore, separate the data into two groups: national brands and private labels, since the demand for private labels is likely to exhibit different patterns than for national brands.

11) ***Holiday price rigidity****:* Levy et al. (2010) provide evidence suggesting that menu costs are higher than normal during the Thanksgiving-Christmas holiday period. It is, therefore, possible that there are fewer small price changes during the Thanksgiving-Christmas period, leading to a decline in the correlation between sales volumes and small price changes. We, therefore, re-estimate equation 1, using only the observations from the Thanksgiving-Christmas period.

12) ***Another prediction of Barro's (1972) model***: In the paper, we study the correlation between small price changes and sales volumes. However, Barro's (1972) model, as shown in section 2, also predicts that sales volume should also be correlated with the number of price changes. In other words, prices of products with high sales volumes should change more frequently than the prices of products with low sales volumes. We test this hypothesis in the appendix.

13) ***Controlling for peak days***: Bonomo et al. (2022) show that in their data, the majority of price changes occur during "peak days." Following their definition, for each category in each store, we identify peak days as the subset of the most active days that jointly account for one-half of all price changes in a store over the entire sample period. We then control for peak days in the regressions.

14) ***Cross-category comparisons***: We show that there are large variations in both the average sales volume and the likelihood of small price changes across categories. We then show that as we hypothesize, some of the variation in the likelihood of small price changes can be explained by the average sales volumes.

15) ***Excluding observations on the multi-unit package***: Some of the products in our

dataset are composed of several units. For example, we have products such as 6-packs of beer, or a 4-pack of canned tuna. Above, we treat such packages as a single good, because the consumer pays once for the entire package. However, these may add noise to the regression, because it is unclear how consumers perceive such packages. We, therefore, exclude such multi-unit packaged goods and focus on products that are sold in single units.

16) ***Product level regressions***: We show that the results we obtained for the product level correlation between small price changes and sales volumes hold when we add further controls and when we estimate the correlations using linear probability models.

17) ***Storable vs. non-storable products***: Retailers might employ different strategies for storable vs. non-storable products. We therefore test for the robustness of our results by assessing them separately for storable and non-storable products.

18) ***Asymmetry in the correlations***: Our model predicts a symmetric correlation between sales volumes and the likelihood of small price changes. However, it is possible that the correlation is asymmetric, for example, if shoppers are not attentive to small price changes (Chen et al., 2008, Chakraborty et al., 2015). We therefore estimate separate regressions for price increases and price decreases.

19) ***Cross-category analysis***: We conduct further analysis comparing the likelihood of small price changes and the sales volumes across categories.

The Online Supplementary Appendix contains the details of these analyses. Overall, our main results are broadly unchanged, and are robust across the different specifications.

6. Conclusion and policy implications

The finding of frequent small price changes in many retail price datasets has been interpreted by authors as prima facie evidence against simple menu cost models. We find, however, that sales volume can explain some of the small price changes found in many datasets. When a retailer expects to sell many units, then small price changes can be profitable even in the presence of lump sum menu costs.

We use Dominick’s scanner price dataset to show a strong positive correlation between the frequency of small price changes and products’ sales volume. This finding is robust. It holds across product categories, within product categories, and for individual products. It is also robust to a variety of sensitivity analyses such as the definition of “small” price changes, measurement errors, the inclusion of control variables, firms’ size, price synchronization, and the time horizon used to compute the average sales volume.

Our findings hold irrespective of how we measure price changes—in absolute or relative terms. The latter is useful if one wants to assess the "Calvo-ness" of the relevant model.

Our findings are consistent with the findings reported by Bhattarai and Schoenle (2014) and Kang and Usher (2023), who employ more recent datasets. However, the advantage of Dominick's dataset, in comparison to more recent datasets is its richness. In addition to prices and sales volume—two critical variables for our analyses, it also contains data on wholesale prices, promotions and sales, pricing zones, shoppers' socio-demographics, markups, etc. We employ these additional variables to check robustness.

Above, we use Barro's (1972) model to illustrate the theoretical correlation between sales volumes and the size of price changes. However, Barro's (1972) model is too stylistic for deriving predictions about the distribution of the size of price changes. In addition, it cannot predict the number of small price changes observed in many datasets unless we assume unrealistically high sales volumes. Therefore, we believe that there is a need for models that will account for sales volumes, perhaps along the lines of Golosov and Lucas (2007). It would then be possible to evaluate the implications of heterogeneity in sales volumes for the macro-level price rigidity.

Such a model might yield important insights. First, it might yield a non-trivial distribution of the size of price changes even if all producers sell one product and the menu costs are fixed. Second, if the size of price changes depends on the sales volume, then the existence of small price changes does not rule out selection. Thus, unlike many of the existing models, in such a model, the kurtosis of the distribution of the size of price changes might not necessarily indicate selection (Alvarez et al., 2016). Therefore, for a given frequency of price changes, we might obtain a result where a monetary shock has only a small real effect even in the presence of many small price changes (Kang and Usher, 2023). Related to this, Karadi et al. (forthcoming) find that the likelihood of a price change does not depend on the gap between the price and the optimal price. They interpret their finding as evidence against selection. However, in a model where price changes depend on sales volumes, we may have selection together with both small and large price changes in response to a monetary shock.

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Table 1. Pooled regressions of small price changes and sales volume

	(1)	(2)	(3)	(4)
Average sales volume	0.026***	0.017***	0.017***	0.033***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	9,553,542	9,553,542	9,553,542	2,328,405

Notes: The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of a baseline regression that includes only the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for the sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. All regressions also include fixed effects for categories, stores, products, years, and months. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table 2. Category-level regressions of small price changes and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0262*** (0.0034)	0.019*** (0.0032)	0.0188*** (0.0031)	0.029*** (0.0068)
	Observations	144,461	144,461	144,461	44,950
Bath Soap	Coefficient (Std.)	0.0293*** (0.008)	0.0277*** (0.0082)	0.0285*** (0.0081)	0.0972*** (0.0192)
	Observations	15,295	15,295	15,295	3,208
Bathroom Tissues	Coefficient (Std.)	0.0408*** (0.007)	0.0179** (0.0058)	0.0184*** (0.0057)	0.0386*** (0.0084)
	Observations	149,441	149,441	149,441	47,041
Beer	Coefficient (Std.)	0.013*** (0.0012)	0.0147*** (0.0012)	0.0147*** (0.0012)	0.0699*** (0.0063)
	Observations	290,620	290,620	290,620	27,348
Bottled Juice	Coefficient (Std.)	0.0329*** (0.0053)	0.0239*** (0.0044)	0.0238*** (0.0045)	0.0304*** (0.0063)
	Observations	496,557	496,557	496,557	133,714
Canned Soup	Coefficient (Std.)	0.0158*** (0.0056)	0.0108* (0.005)	0.0134** (0.0049)	0.0144** (0.0049)
	Observations	495,543	495,543	495,543	176,235
Canned Tuna	Coefficient (Std.)	0.0237*** (0.0054)	0.0134** (0.0046)	0.0131** (0.0045)	0.0225*** (0.0058)
	Observations	213,043	213,043	213,043	64,161
Cereals	Coefficient (Std.)	0.0204*** (0.0037)	0.0149*** (0.0034)	0.0148*** (0.0034)	0.0188*** (0.0046)
	Observations	357,120	357,120	357,120	155,367
Cheese	Coefficient (Std.)	0.0201*** (0.0028)	0.0113*** (0.0025)	0.0112*** (0.0025)	0.0113*** (0.0033)
	Observations	796,150	796,150	796,150	224,889
Cigarettes	Coefficient (Std.)	0.0084** (0.0046)	0.0073 (0.0045)	0.0074 (0.0044)	0.0069 (0.0054)
	Observations	36,157	36,157	36,157	30,262
Cookies	Coefficient (Std.)	0.0267*** (0.0018)	0.022*** (0.0017)	0.0223*** (0.0017)	0.046*** (0.0035)
	Observations	688,761	688,761	688,761	132,488
Crackers	Coefficient (Std.)	0.0379*** (0.0031)	0.0302*** (0.0026)	0.0306*** (0.0026)	0.0467*** (0.0072)
	Observations	245,185	245,185	245,185	50,029
Dish Detergent	Coefficient (Std.)	0.0393*** (0.0044)	0.028*** (0.0036)	0.0279*** (0.0035)	0.0361*** (0.0041)
	Observations	189,633	189,633	189,633	53,289
Fabric Softener	Coefficient (Std.)	0.0238*** (0.0048)	0.0123*** (0.0043)	0.0126*** (0.0043)	0.0325*** (0.0057)
	Observations	181,056	181,056	181,056	56,234
Front-End-Candies	Coefficient (Std.)	0.0047 (0.0041)	0.0057 (0.0033)	0.0059 (0.0032)	0.0053 (0.0031)
	Observations	278,853	278,853	278,853	111,635
Frozen Dinners	Coefficient (Std.)	0.0475*** (0.0034)	0.036*** (0.0028)	0.0389*** (0.0027)	0.0795*** (0.0066)
	Observations	203,191	203,191	203,191	37,527

Table 2. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.028*** (0.0021)	0.0259*** (0.0019)	0.0266*** (0.0019)	0.0443*** (0.0034)
	Observations	864,832	864,832	864,832	213,545
Frozen Juices	Coefficient (Std.)	0.0273*** (0.0048)	0.0198*** (0.0042)	0.0206*** (0.0041)	0.0293*** (0.0062)
	Observations	308,817	308,817	308,817	87,919
Grooming Products	Coefficient (Std.)	0.0187*** (0.0023)	0.0209*** (0.0024)	0.021*** (0.0024)	0.0417*** (0.0069)
	Observations	269,873	269,873	269,873	51,819
Laundry Detergents	Coefficient (Std.)	0.0196*** (0.0032)	0.0093*** (0.0028)	0.0097*** (0.0028)	0.02*** (0.0045)
	Observations	272,765	272,765	272,765	85,184
Oatmeal	Coefficient (Std.)	0.028*** (0.008)	0.0152* (0.0067)	0.0154* (0.0067)	0.0338*** (0.0098)
	Observations	79,983	79,983	79,983	36,043
Paper Towels	Coefficient (Std.)	0.0454*** (0.0105)	0.0316*** (0.0118)	0.0321*** (0.0119)	0.0378*** (0.0115)
	Observations	116,204	116,204	116,204	29,280
Refrigerated Juices	Coefficient (Std.)	0.0357*** (0.0047)	0.0209*** (0.0039)	0.0209*** (0.0039)	0.033*** (0.0056)
	Observations	306,865	306,865	306,865	72,031
Shampoos	Coefficient (Std.)	0.0162*** (0.0015)	0.02*** (0.0016)	0.0201*** (0.0015)	0.046*** (0.0052)
	Observations	261,778	261,778	261,778	40,996
Snack Crackers	Coefficient (Std.)	0.0319*** (0.0032)	0.0282*** (0.003)	0.0284*** (0.003)	0.0518*** (0.0052)
	Observations	398,665	398,665	398,665	78,581
Soaps	Coefficient (Std.)	0.0374*** (0.0055)	0.0226*** (0.005)	0.0237*** (0.005)	0.049*** (0.0076)
	Observations	152,379	152,379	152,379	46,829
Soft Drinks	Coefficient (Std.)	0.0211*** (0.0017)	0.024*** (0.0013)	0.023*** (0.0012)	0.0517*** (0.0037)
	Observations	1,350,618	1,350,618	1,350,618	156,004
Toothbrushes	Coefficient (Std.)	0.0204*** (0.0028)	0.02*** (0.0028)	0.0195*** (0.0028)	0.0498*** (0.0076)
	Observations	125,380	125,380	125,380	24,955
Toothpastes	Coefficient (Std.)	0.0123*** (0.0026)	0.0111*** (0.0022)	0.0111*** (0.0022)	0.0393*** (0.0063)
	Observations	264,317	264,317	264,317	56,842
Average coefficients		**0.0260**	**0.0195**	**0.0198**	**0.0384**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of baseline regression that includes only the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * p < 10%, ** p < 5%, *** p < 1%

Table 3. Product-level regressions of the % of small price changes and sales volume by categories

Product Category	Average coefficient estimate (1)	Number of coefficients (2)	Percentage of positive coefficients (3)	Number of significant coefficients (4)	% of positive and significant coefficients (5)
Analgesics	0.031	213	83.20%	87	98.25%
Bath Soaps	0.034	33	69.77%	14	100.00%
Bathroom tissues	0.057	100	79.31%	34	90.24%
Beers	0.019	202	91.57%	142	97.80%
Bottled juices	0.051	370	83.67%	192	84.56%
Canned soups	0.041	348	77.41%	145	90.37%
Canned tuna	0.037	181	76.16%	60	80.00%
Cereals	0.047	345	80.13%	99	89.32%
Cheese	0.036	474	81.76%	224	90.26%
Cigarettes	-0.020	107	71.43%	4	40.00%
Cookies	0.034	667	82.42%	304	94.71%
Crackers	0.044	212	88.41%	118	98.84%
Dish detergents	0.041	199	85.71%	84	91.89%
Fabric softeners	0.043	226	85.35%	69	91.67%
Front end candies	0.053	275	75.28%	92	91.03%
Frozen dinners	0.053	215	92.06%	131	97.59%
Frozen entrees	0.052	671	89.32%	363	97.46%
Frozen juices	0.032	142	75.00%	62	97.67%
Grooming products	0.011	531	80.94%	229	90.65%
Laundry detergents	0.018	406	75.00%	101	81.40%
Oatmeal	0.047	69	76.81%	20	84.62%
Paper towels	0.052	90	73.61%	33	90.91%
Refrigerated juices	0.036	176	73.08%	77	85.92%
Shampoos	0.022	614	82.78%	282	96.72%
Snack crackers	0.041	282	87.36%	172	92.55%
Soaps	0.039	217	80.55%	421	84.31%
Soft drinks	0.032	902	82.49%	72	94.87%
Toothbrushes	0.026	204	82.84%	89	95.83%
Toothpastes	0.015	337	79.67%	99	92.75%
Average	**0.035**	**303**	**73.29%**	**96**	**90.08%**

Notes: For each product category, column 1 presents the average estimated coefficients. Column 2 presents the total number of coefficients. Column 3 presents the % of positive coefficients out of all coefficients. Column 4 presents the total number of coefficients that are statistically significant at the 5% level. Column 5 presents the % of coefficients that are positive and statistically significant, at the 5% level. Products are identified by their UPCs.

Table 4. Category-level regressions of small price changes, sales volume, and revenue

Category		Correlation	Revenue	Sales volume and revenue	
		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.8088	0.0244*** (0.0035)	0.2246*** (0.0463)	-0.201*** (0.0467)
	Observations		144,461		
Bath Soap	Coefficient (Std.)	0.7757	0.0319*** (0.0082)	-0.3214** (0.1271)	0.3527* (0.1279)
	Observations		15,295		
Bathroom Tissues	Coefficient (Std.)	0.7838	0.036*** (0.0062)	0.8456*** (0.1168)	-0.8195*** (0.1169)
	Observations		149,441		
Beer	Coefficient (Std.)	0.8642	0.0131*** (0.0012)	-0.0562* (0.0288)	0.0692** (0.0287)
	Observations		290,620		
Bottled Juice	Coefficient (Std.)	0.9138	0.0305*** (0.0052)	0.8371*** (0.1025)	-0.8065*** (0.1027)
	Observations		496,557		
Canned Soup	Coefficient (Std.)	0.9458	0.0148*** (0.0056)	0.5075*** (0.0785)	-0.4943*** (0.0791)
	Observations		495,543		
Canned Tuna	Coefficient (Std.)	0.863	0.0201*** (0.0054)	0.5276*** (0.1175)	-0.5093*** (0.1183)
	Observations		213,043		
Cereals	Coefficient (Std.)	0.9311	0.0203*** (0.0038)	0.0634 (0.0429)	-0.0433 (0.0437)
	Observations		357,120		
Cheese	Coefficient (Std.)	0.86	0.018*** (0.0029)	0.4048*** (0.1085)	-0.3846*** (0.1091)
	Observations		796,150		
Cigarettes	Coefficient (Std.)	0.9938	0.0102** (0.0046)	-0.3209*** (0.0622)	0.3303*** (0.062)
	Observations		36,157		
Cookies	Coefficient (Std.)	0.9485	0.0273*** (0.0018)	-0.0045 (0.022)	0.0318 (0.0221)
	Observations		688,761		
Crackers	Coefficient (Std.)	0.9536	0.038*** (0.0031)	0.1257** (0.0554)	-0.0881 (0.056)
	Observations		245,185		
Dish Detergent	Coefficient (Std.)	0.8123	0.038*** (0.0043)	0.4862*** (0.1382)	-0.4511*** (0.1376)
	Observations		189,633		
Fabric Softener	Coefficient (Std.)	0.7951	0.0181*** (0.0048)	0.9508*** (0.2067)	-0.9307*** (0.208)
	Observations		181,056		
Front−End−Candies	Coefficient (Std.)	0.8611	0.0045 (0.0042)	0.8471*** (0.075)	-0.8406*** (0.0755)
	Observations		278,853		
Frozen Dinners	Coefficient (Std.)	0.726	0.0471*** (0.0033)	0.2111*** (0.0446)	-0.162*** (0.044)
	Observations		203,191		

Table 4 (Cont.)

Category		Correlation (1)	Revenue (2)	Sales volume and Revenue (3)	(4)
Frozen Entrees	Coefficient (Std.)	0.8584	0.0271*** (0.002)	0.1611*** (0.0155)	-0.1321*** (0.0153)
	Observations		864,832		
Frozen Juices	Coefficient (Std.)	0.9651	0.0255*** (0.005)	0.2732*** (0.068)	-0.2456*** (0.0687)
	Observations		308,817		
Grooming Products	Coefficient (Std.)	0.811	0.0188*** (0.0024)	0.0026 (0.0378)	0.0162 (0.0382)
	Observations		269,873		
Laundry Detergents	Coefficient (Std.)	0.9153	0.0174*** (0.0031)	0.3272*** (0.061)	-0.311*** (0.0604)
	Observations		272,765		
Oatmeal	Coefficient (Std.)	0.8775	0.0293*** (0.0082)	-0.0121 (0.0248)	0.0416 (0.0255)
	Observations		79,983		
Paper Towels	Coefficient (Std.)	0.7593	0.0395*** (0.0107)	0.8975*** (0.204)	-0.8574*** (0.2028)
	Observations		116,204		
Refrigerated Juices	Coefficient (Std.)	0.9201	0.0351*** (0.0048)	0.1247** (0.0586)	-0.09 (0.0592)
	Observations		306,865		
Shampoos	Coefficient (Std.)	0.7226	0.0162*** (0.0015)	0.0171 (0.0162)	-0.0008 (0.0162)
	Observations		261,778		
Snack Crackers	Coefficient (Std.)	0.9124	0.0324*** (0.0033)	0.0736 (0.083)	-0.0414 (0.0839)
	Observations		398,665		
Soaps	Coefficient (Std.)	0.6725	0.0359*** (0.0055)	0.4935*** (0.0435)	-0.4684*** (0.0429)
	Observations		152,379		
Soft Drinks	Coefficient (Std.)	0.756	0.0207*** (0.0017)	0.5154*** (0.1761)	-0.4784*** (0.1763)
	Observations		1,350,618		
Toothbrushes	Coefficient (Std.)	0.82	0.0202*** (0.0029)	0.045 (0.0418)	-0.0247 (0.0419)
	Observations		125,380		
Toothpastes	Coefficient (Std.)	0.8902	0.0137*** (0.0026)	-0.1035*** (0.0373)	0.1181*** (0.0373)
	Observations		264,317		
Average coefficients		**0.8523**	**0.03397**	**0.1902**	**-0.1705**

Notes: Column 1 reports the Pearson correlation coefficient between the sales volume and revenues for each category. Columns 2–4 report the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable in all columns is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. In column 2, the main independent variable is the log of average revenue for product *i* in store *s* over the sample period. In columns 3 and 4, we report the results of a regression that includes both the log of the sales volume and the log of the revenue as independent variables. Column 3 reports the coefficients of the sales volume. Column 4 reports the coefficients of the revenue. All regressions also include fixed effects for months, years, stores, and products. We estimate separate regressions for each product category, clustering the errors by product.
* $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table 5. Category-level regressions of small price changes and synchronization

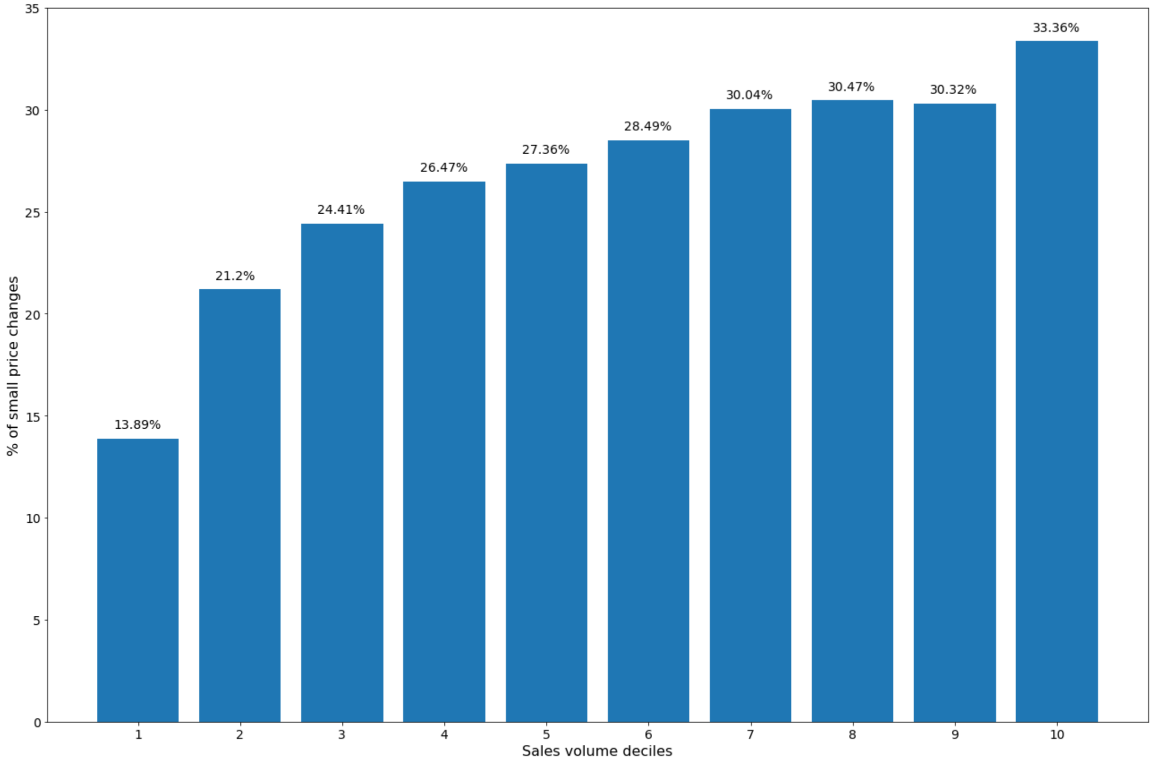
Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient	0.026***	0.0258***	0.024***	0.0245***
	(Std.)	(0.0034)	(0.0034)	(0.0034)	(0.0033)
	Observations	144,461	144,461	143,780	139,228
Bath Soap	Coefficient	0.0313***	0.0307***	0.0266***	0.0243***
	(Std.)	(0.0077)	(0.0077)	(0.0086)	(0.0088)
	Observations	15,295	15,288	13,228	10,538
Bathroom Tissues	Coefficient	0.0406***	0.0402***	0.0398***	0.0436***
	(Std.)	(0.007)	(0.007)	(0.007)	(0.0073)
	Observations	149,441	149,441	148,926	139,207
Beer	Coefficient	0.0123***	0.0114***	0.0114***	0.0119***
	(Std.)	(0.0013)	(0.0012)	(0.0012)	(0.0013)
	Observations	290,620	290,617	290,524	267,233
Bottled Juice	Coefficient	0.0357***	0.0356***	0.0348***	0.0357***
	(Std.)	(0.0052)	(0.0052)	(0.0052)	(0.0054)
	Observations	496,557	496,555	496,461	485,670
Canned Soup	Coefficient	0.0174***	0.0174***	0.0172***	0.0169***
	(Std.)	(0.0056)	(0.0056)	(0.0055)	(0.0056)
	Observations	495,543	495,543	495,276	490,981
Canned Tuna	Coefficient	0.0229***	0.0226***	0.023***	0.0234***
	(Std.)	(0.0053)	(0.0053)	(0.0053)	(0.0056)
	Observations	213,043	213,043	212,567	202,922
Cereals	Coefficient	0.0205***	0.0205***	0.0195***	0.0205***
	(Std.)	(0.0037)	(0.0037)	(0.0035)	(0.0034)
	Observations	357,120	357,120	357,077	352,500
Cheese	Coefficient	0.02***	0.0198***	0.0198***	0.0198***
	(Std.)	(0.0028)	(0.0028)	(0.0028)	(0.003)
	Observations	796,150	796,148	796,142	758,753
Cigarettes	Coefficient	0.007	0.0076	0.0081	0.0091*
	(Std.)	(0.0051)	(0.005)	(0.0051)	(0.0047)
	Observations	36,157	36,152	35,824	35,408
Cookies	Coefficient	0.0272***	0.0278***	0.0275***	0.0277***
	(Std.)	(0.0019)	(0.0019)	(0.0019)	(0.0019)
	Observations	688,761	688,759	688,726	681,886
Crackers	Coefficient	0.0378***	0.0379***	0.0369***	0.0359***
	(Std.)	(0.0031)	(0.0031)	(0.003)	(0.003)
	Observations	245,185	245,183	244,898	236,163
Dish Detergent	Coefficient	0.0396***	0.0387***	0.0372***	0.0394***
	(Std.)	(0.0045)	(0.0045)	(0.0043)	(0.0041)
	Observations	189,633	189,633	189,182	185,996
Fabric Softener	Coefficient	0.0255***	0.0252***	0.0227***	0.0239***
	(Std.)	(0.0048)	(0.0048)	(0.0047)	(0.0048)
	Observations	181,056	181,056	180,721	168,434
Front-End-Candies	Coefficient	0.0042	0.0032	0.0054	0.0064*
	(Std.)	(0.0041)	(0.0041)	(0.0034)	(0.0035)
	Observations	278,853	278,853	278,019	267,951
Frozen Dinners	Coefficient	0.0439***	0.0439***	0.0426***	0.0426***
	(Std.)	(0.0037)	(0.0037)	(0.0036)	(0.0036)
	Observations	203,191	203,191	203,064	202,953

Table 5. (Cont.) Category-level regressions of small price changes, synchronization

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0317*** (0.0023)	0.0318*** (0.0023)	0.0309*** (0.0022)	0.0305*** (0.0022)
	Observations	864,832	864,832	864,819	862,193
Frozen Juices	Coefficient (Std.)	0.0277*** (0.0048)	0.0279*** (0.0048)	0.0273*** (0.0046)	0.0273*** (0.0045)
	Observations	308,817	308,817	308,802	298,899
Grooming Products	Coefficient (Std.)	0.0188*** (0.0024)	0.019*** (0.0024)	0.0186*** (0.0024)	0.0186*** (0.0025)
	Observations	269,873	269,872	269,780	268,124
Laundry Detergents	Coefficient (Std.)	0.02*** (0.0033)	0.0198*** (0.0033)	0.0178*** (0.0032)	0.0176*** (0.0033)
	Observations	272,765	272,765	272,695	269,543
Oatmeal	Coefficient (Std.)	0.0281*** (0.0079)	0.0281*** (0.008)	0.0282*** (0.0079)	0.0255*** (0.0081)
	Observations	79,983	79,983	78,341	71,261
Paper Towels	Coefficient (Std.)	0.0447*** (0.0104)	0.0447*** (0.0104)	0.0436*** (0.0103)	0.048*** (0.0109)
	Observations	116,204	116,204	115,754	108,011
Refrigerated Juices	Coefficient (Std.)	0.035*** (0.0046)	0.0352*** (0.0046)	0.0335*** (0.0044)	0.0344*** (0.0043)
	Observations	306,865	306,865	306,841	293,807
Shampoos	Coefficient (Std.)	0.0146*** (0.0016)	0.0138*** (0.0016)	0.0128*** (0.0016)	0.0127*** (0.0016)
	Observations	261,778	261,778	261,740	257,886
Snack Crackers	Coefficient (Std.)	0.0338*** (0.0032)	0.0335*** (0.0032)	0.0328*** (0.0031)	0.0328*** (0.003)
	Observations	398,665	398,665	398,573	389,240
Soaps	Coefficient (Std.)	0.0375*** (0.0056)	0.0372*** (0.0055)	0.0348*** (0.0055)	0.0345*** (0.0056)
	Observations	152,379	152,379	152,104	149,407
Soft Drinks	Coefficient (Std.)	0.02*** (0.0019)	0.0197*** (0.0019)	0.0199*** (0.0019)	0.02*** (0.0019)
	Observations	1,350,618	1,350,617	1,350,613	1,337,747
Toothbrushes	Coefficient (Std.)	0.023*** (0.0028)	0.0219*** (0.0028)	0.0204*** (0.003)	0.0205*** (0.0029)
	Observations	125,380	125,380	124,743	122,787
Toothpastes	Coefficient (Std.)	0.0112*** (0.0026)	0.0093*** (0.0026)	0.0062** (0.0026)	0.0067*** (0.0026)
	Observations	264,317	264,317	264,156	260,282
Average coefficients		**0.0261**	**0.0259**	**0.0249**	**0.0253**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of a regression that includes the log of average sales volume and the average number of products offered in the category by the same producer. In column 2, we add the percentage of the products whose prices changed in the same week, excluding the current observation. In column 3, we add the average size of contemporaneous price changes, excluding the current observation. In column 4, we add the percentage of the products that are produced by the same producer and that changed price in the same week, excluding the current observation. All regressions include fixed effects for months, years, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Figure 1. Frequency of small price changes by sales volume deciles



Notes: The chart was obtained by merging all 29 product categories and dividing the resulting data into deciles according to the products' sales volume. The % of small price changes $(\Delta P \leq 10¢)$ was calculated for each decile as a ratio of the number of small price changes to the number of total price changes in each decile.

Figure 2. Frequency of price changes by size for high, medium, and low sales volume products

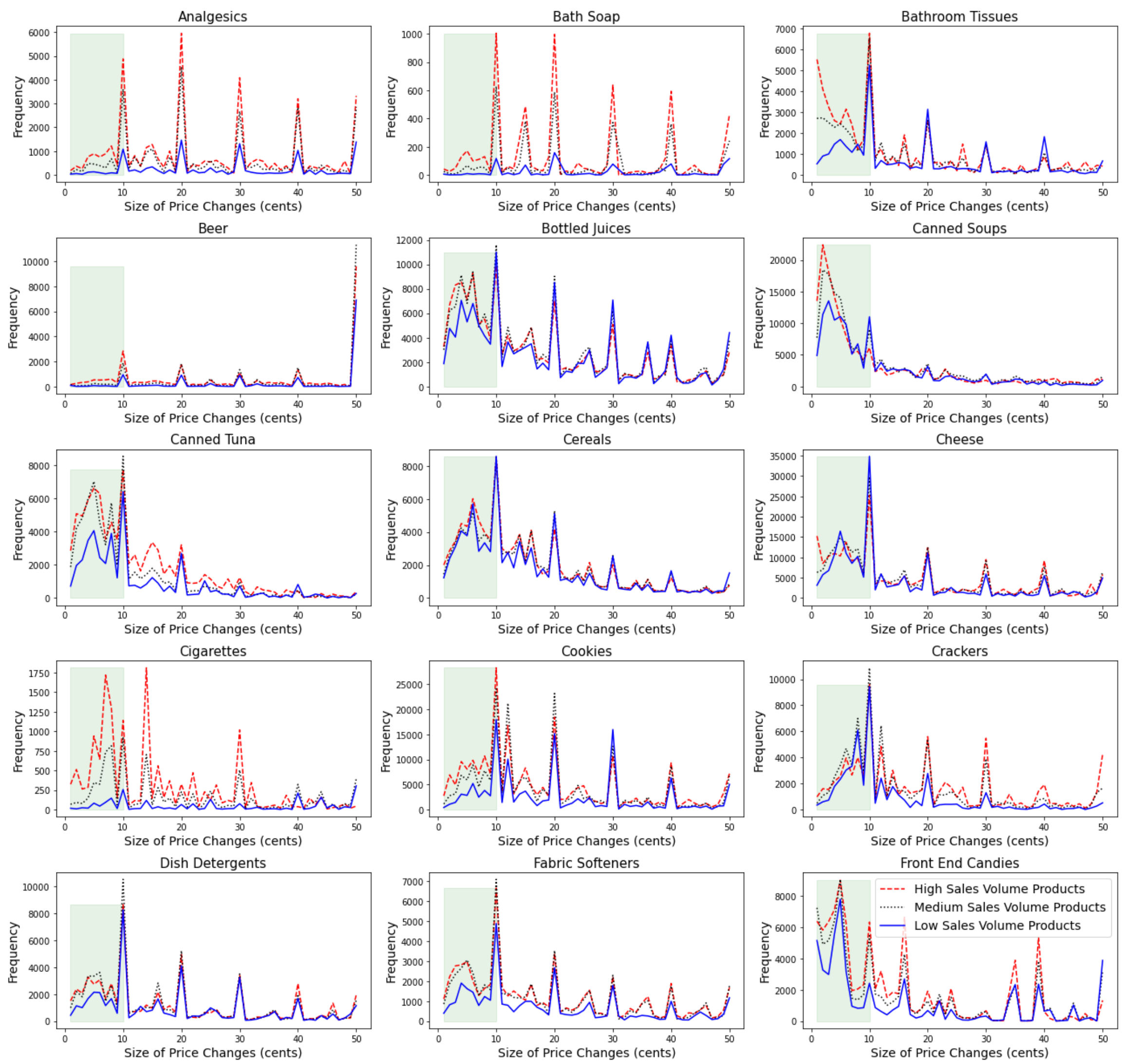
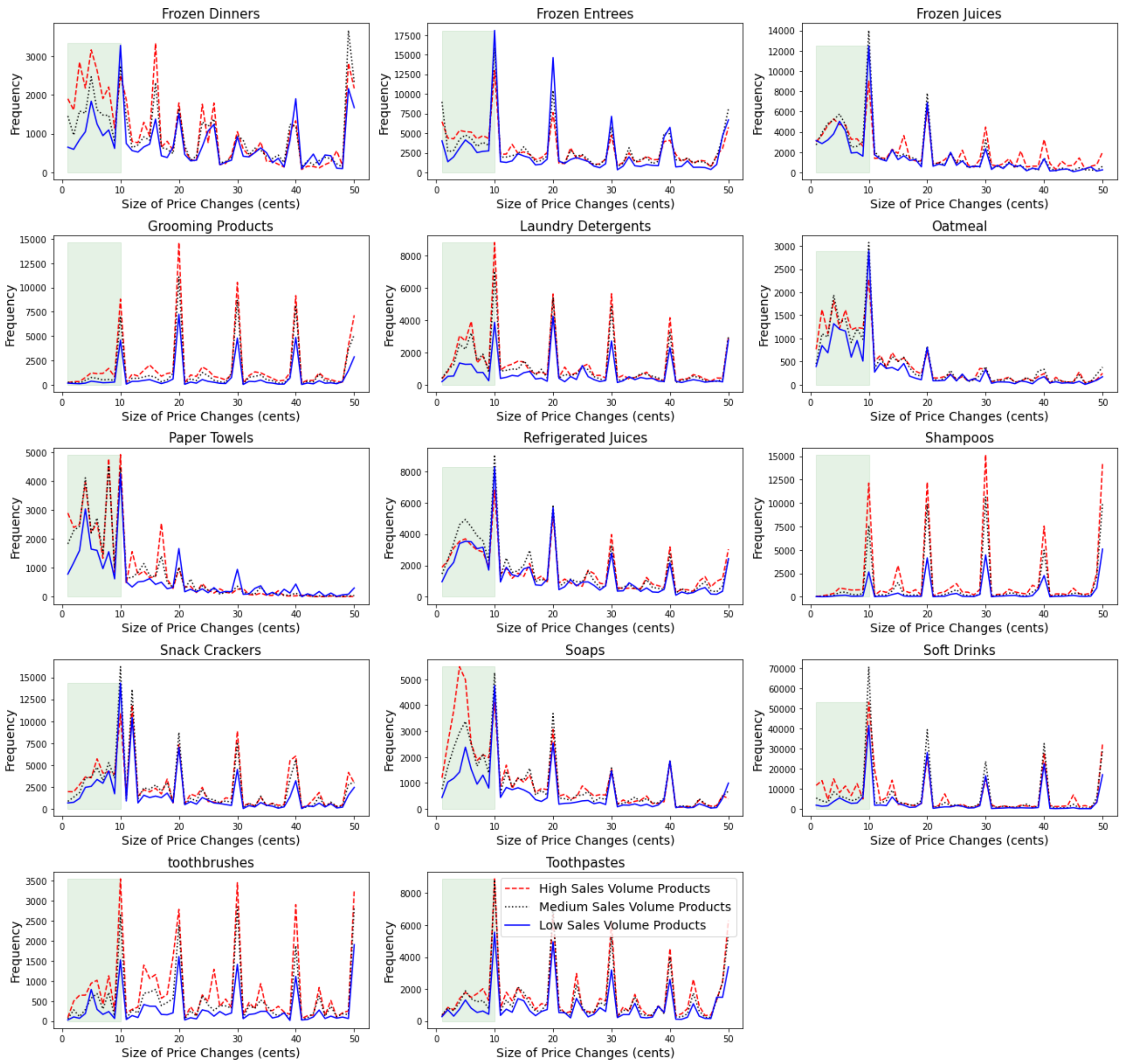
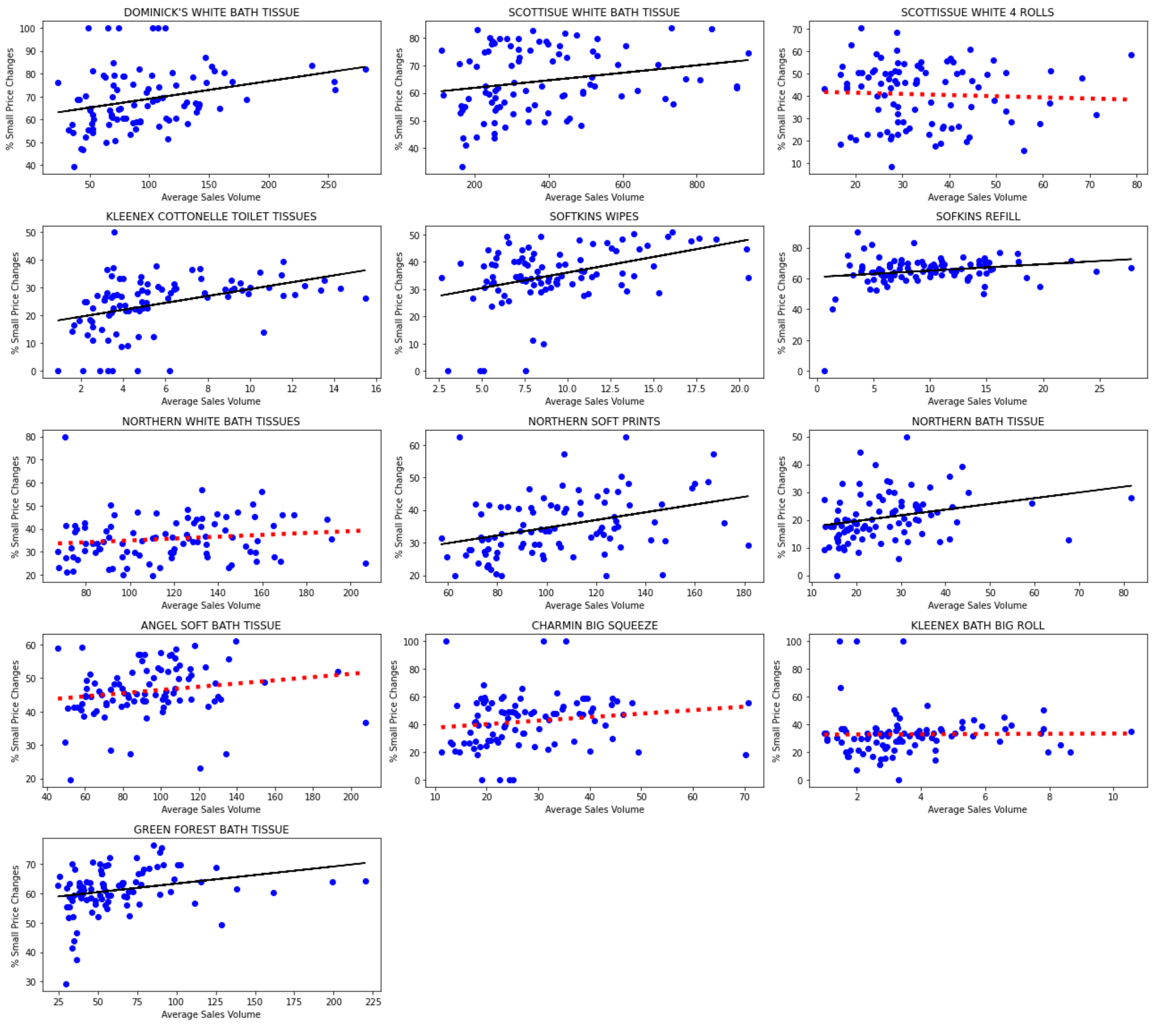


Figure 2. (Cont.)



Notes: For each category, the figure shows the frequency of price changes for each size of price change from 1¢ to 50¢, comparing high sales volume products to medium sales volume products, and low sales volume products. To obtain the figures, we compute the average sales volume over the entire sample period for each product, in each store. We then group the products into high, medium, and low sales volume products. High (low) sales volume products are products in the high (low) third of the distribution. Medium sales volume products are in the middle third of the distribution. The *y*-axis shows the frequency of price changes. The red dashed line depicts the frequency of price changes for the high sales-volume products, the purple dotted line depicts the frequency of price changes for the medium sales-volume products, and the blue solid line depicts the frequency of price changes for the low sales volume products. The green shaded area marks the range of small price changes, $\Delta P \leq 10$¢.

Figure 3. Product-level correlations between sales volume and small price changes in the Bathroom Tissues Category



Note: The figure depicts the correlation between average sales volume (*x*-axis) and the percentage of small price changes for various products in the bathroom tissues category. Each dot in the figures represents the data for the product in a specific store. There are 93 dots in each figure, one for each store. The straight lines in the figures are the regression lines. Black solid regression lines indicate that the regression coefficient is significant at the 5% significance level, which is the case for 8 of the 13 products. The regression lines that are not statistically significant are marked with red dotted lines.

Online Supplementary Web Appendix

<u>Not for Publication</u>

Small Price Changes, Sales Volume, and Menu Cost

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Appendix A. Controlling for measurement errors

We use a scanner dataset. As Eichenbaum et al. (2014) note, the distribution of the size of price changes in scanner datasets is prone to measurement errors. The errors may arise because, in scanner datasets, the price of a product in a given week is calculated as the ratio of the sales revenue to the quantity sold. Thus, if the price has changed during the week, or if some consumers used coupons, the price in the dataset might differ from the actual transaction price in that week.

This type of error is less of a concern in Dominick's dataset, because prices at Dominick's are set on a weekly basis, and the use of coupons in the period we study was limited. See Barsky et al. (2003), Chen et al. (2008), and Levy et al. (2010, 2011). Nevertheless, to mitigate possible concerns, we use in the paper only those price change observations after which the price has remained unchanged for at least 2 weeks. If a price remains unchanged for more than one week, then it is unlikely to be a mistake, since it is unlikely that the same error occurred two weeks in a row.

In this appendix, we conduct two more robustness checks. First, Table A1 presents the results of regressions equivalent to the regressions we present in Table 3 in the paper. This time, however, we include all price changes but exclude price changes smaller or equal to 2¢. Eichenbaum et al. (2014) suggest that such small price changes could be the result of measurement errors. Alvarez et al. (2016) also use Dominick's data, and they remove observations on price changes of 1¢. We, therefore, are more conservative by using a stricter rule than Alvarez et al. (2016). The regressions take the following form:

$$\begin{aligned} small\ \ price\ change_{i,s,t} &= \alpha + \beta \ln(average\ sales\ volume_{i,s}) + \gamma \mathbf{X}_{i,s,t} \\ &+ month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \end{aligned} \tag{A1}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢ and larger than 2¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products. *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product.

The values in Table A1 are the coefficients of the log of the average sales volume. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. Consistent with the results we report in the paper, we find that all the coefficients of the log of the average sales volume are positive. 28 of the 29 coefficients are statistically significant. The average coefficient is 0.030, suggesting that a 1% increase in the sales volume is associated with a 3% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). All the coefficients are positive and statistically significant: 26 at the 1% level, two at the 5% level, and one at the 10% level. The average coefficient is 0.025, suggesting that a 1% increase in the sales volume is associated with a 2.5% increase in the likelihood of a small price change.

In column 3, we also add control for 9-ending prices. All coefficients remain positive and statistically significant: 26 at the 1% level, one at the 5%, and two at the 10% level. The average coefficient is 0.023, suggesting that a 1% increase in the sales volume is associated with a 2.3% increase in the likelihood of a small price change.

As a further control for the possible effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, the results are even stronger. All the coefficients are positive and statistically significant at the 1% level. The average coefficient is 0.045, suggesting that a 1% increase in the sales volume is associated with a 4.5% increase in the likelihood of a small price change.

As a second robustness test, we re-run the above regressions, after dropping observations if Dominick's sales flag indicated that there was a coupon use in either the week the price changed or in the preceding week because according to Eichenbaum et al. (2014), that might lead to spurious small price changes.

Table A2 reports the estimation results. The coefficient estimates are similar in sign, magnitude, and statistical significance, to the corresponding figures in Table A1. In all columns, the coefficient estimates are positive and significant, ranging between 0.025

and 0.046, on average.

To summarize, the exclusion of (a) very small price changes, or (b) the exclusion of observations with coupon use, do not change our main result. The likelihood of small price changes remains strongly correlated with the average sales volume. We, therefore, conclude that our results are not likely to be driven by measurement errors.

Table A1. Category-level regressions of small price changes $(\Delta P \leq 10¢)$ and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0343*** (0.0031)	0.0271*** (0.0026)	0.0224*** (0.0025)	0.044*** (0.0057)
	Observations	275,225	275,225	275,225	73,576
Bath Soap	Coefficient (Std.)	0.0396*** (0.0085)	0.044*** (0.0088)	0.0417*** (0.0086)	0.0897*** (0.0162)
	Observations	35,377	35,377	35,377	6,362
Bathroom Tissues	Coefficient (Std.)	0.0311*** (0.0051)	0.019*** (0.0055)	0.0165*** (0.0052)	0.04*** (0.0071)
	Observations	288,963	288,963	288,963	58,189
Beer	Coefficient (Std.)	0.0212*** (0.0013)	0.023*** (0.0011)	0.0198*** (0.001)	0.0673*** (0.005)
	Observations	456,740	456,740	456,740	54,870
Bottled Juice	Coefficient (Std.)	0.0457*** (0.0042)	0.0343*** (0.0031)	0.0304*** (0.0032)	0.0395*** (0.0049)
	Observations	881,264	881,264	881,264	188,079
Canned Soup	Coefficient (Std.)	0.0202*** (0.0041)	0.0109*** (0.0037)	0.0121*** (0.0036)	0.0268*** (0.0051)
	Observations	814,575	814,575	814,575	191,616
Canned Tuna	Coefficient (Std.)	0.0322*** (0.0051)	0.0246*** (0.0045)	0.0216*** (0.0043)	0.0361*** (0.0057)
	Observations	330,897	330,897	330,897	89,246
Cereals	Coefficient (Std.)	0.0177*** (0.0025)	0.0144*** (0.0023)	0.0135*** (0.0024)	0.0251*** (0.0038)
	Observations	685,899	685,899	685,899	227,390
Cheese	Coefficient (Std.)	0.0301*** (0.0029)	0.0189*** (0.0024)	0.0159*** (0.0024)	0.0123*** (0.0044)
	Observations	1,615,593	1,615,593	1,615,593	371,129
Cigarettes	Coefficient (Std.)	0.0131 (0.0081)	0.0144* (0.0071)	0.014* (0.007)	0.0148*** (0.005)
	Observations	15,395	15,395	15,395	9,130
Cookies	Coefficient (Std.)	0.0348*** (0.0016)	0.0317*** (0.0016)	0.0273*** (0.0015)	0.05*** (0.0031)
	Observations	1,305,448	1,305,448	1,305,448	205,310
Crackers	Coefficient (Std.)	0.044*** (0.0029)	0.0365*** (0.0027)	0.0334*** (0.0026)	0.0516*** (0.0052)
	Observations	453,298	453,298	453,298	78,127
Dish Detergent	Coefficient (Std.)	0.0377*** (0.0037)	0.03*** (0.003)	0.0273*** (0.0029)	0.04*** (0.0047)
	Observations	374,089	374,089	374,089	76,206
Fabric Softener	Coefficient (Std.)	0.0246*** (0.0036)	0.0176*** (0.0033)	0.0153*** (0.0034)	0.0378*** (0.0053)
	Observations	357,746	357,746	357,746	86,846
Front-End-Candies	Coefficient (Std.)	0.0238*** (0.0036)	0.0146*** (0.0028)	0.0139*** (0.0028)	0.0121*** (0.0033)
	Observations	415,331	415,331	415,331	121,111
Frozen Dinners	Coefficient (Std.)	0.0457*** (0.0026)	0.0381*** (0.0025)	0.0373*** (0.0025)	0.101*** (0.0067)
	Observations	477,997	477,997	477,997	57,704

Table A1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0321*** (0.0016)	0.0284*** (0.0015)	0.0279*** (0.0015)	0.0572*** (0.0034)
	Observations	1,768,979	1,768,979	1,768,979	295,796
Frozen Juices	Coefficient (Std.)	0.0262*** (0.0036)	0.0216*** (0.0033)	0.0196*** (0.0032)	0.0308*** (0.0059)
	Observations	602,210	602,210	602,210	112,532
Grooming Products	Coefficient (Std.)	0.0394*** (0.0022)	0.0426*** (0.002)	0.0379*** (0.002)	0.0637*** (0.0061)
	Observations	658,707	658,707	658,707	95,757
Laundry Detergents	Coefficient (Std.)	0.0156*** (0.0029)	0.0133*** (0.0025)	0.0112*** (0.0023)	0.025*** (0.0047)
	Observations	580,679	580,679	580,679	135,575
Oatmeal	Coefficient (Std.)	0.0241*** (0.007)	0.0153** (0.0059)	0.0139*** (0.0059)	0.0416*** (0.0073)
	Observations	154,817	154,817	154,817	51,510
Paper Towels	Coefficient (Std.)	0.0306*** (0.0119)	0.0255** (0.0125)	0.0245* (0.0127)	0.0359*** (0.0119)
	Observations	215,951	215,951	215,951	36,645
Refrigerated Juices	Coefficient (Std.)	0.0239*** (0.0032)	0.0179*** (0.0028)	0.0158*** (0.0027)	0.029*** (0.0047)
	Observations	749,239	749,239	749,239	127,091
Shampoos	Coefficient (Std.)	0.0293*** (0.0013)	0.0337*** (0.0013)	0.0295*** (0.0012)	0.0644*** (0.0042)
	Observations	708,002	708,002	708,002	83,652
Snack Crackers	Coefficient (Std.)	0.0365*** (0.0029)	0.0338*** (0.0028)	0.0305*** (0.0026)	0.0621*** (0.0041)
	Observations	770,442	770,442	770,442	127,881
Soaps	Coefficient (Std.)	0.0231*** (0.0011)	0.0205*** (0.0009)	0.0171*** (0.0008)	0.0442*** (0.0023)
	Observations	4,243,492	4,243,492	4,243,492	305,545
Soft Drinks	Coefficient (Std.)	0.0415*** (0.0058)	0.0342*** (0.0042)	0.0286*** (0.004)	0.0562*** (0.0069)
	Observations	300,763	300,763	300,763	71,459
Toothbrushes	Coefficient (Std.)	0.0248*** (0.0029)	0.0276*** (0.003)	0.0237*** (0.0029)	0.0562*** (0.0059)
	Observations	291,093	291,093	291,093	42,658
Toothpastes	Coefficient (Std.)	0.0242*** (0.0029)	0.0247*** (0.0025)	0.0218*** (0.0024)	0.0507*** (0.0059)
	Observations	584,401	584,401	584,401	84,802
Average coefficients		**0.0299**	**0.0255**	**0.0229**	**0.0450**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or equal to 10¢ and larger than 2¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product i in store s over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the natural log of the average price, the natural log of the absolute change in the wholesale price, and control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table A2. Category-level regressions of small price changes and sales volume, excluding coupon sales

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0388*** (0.0033)	0.0305*** (0.0027)	0.0248*** (0.0025)	0.0475*** (0.0057)
	Observations	278,043	278,043	278,043	75,945
Bath Soap	Coefficient (Std.)	0.0409*** (0.0093)	0.0452*** (0.0095)	0.0422*** (0.0091)	0.0871*** (0.016)
	Observations	35,795	35,795	35,795	6,555
Bathroom Tissues	Coefficient (Std.)	0.0372*** (0.0056)	0.0203*** (0.0053)	0.0177*** (0.0049)	0.0351*** (0.0069)
	Observations	326,382	326,382	326,382	81,914
Beer	Coefficient (Std.)	0.023*** (0.0015)	0.0249*** (0.0012)	0.0208*** (0.0012)	0.0691*** (0.005)
	Observations	459,669	459,669	459,669	56,427
Bottled Juice	Coefficient (Std.)	0.0554*** (0.0043)	0.0393*** (0.003)	0.0343*** (0.0031)	0.0368*** (0.0045)
	Observations	959,958	959,958	959,958	244,198
Canned Soup	Coefficient (Std.)	0.0272*** (0.004)	0.0151*** (0.0034)	0.0158*** (0.0033)	0.0217*** (0.0038)
	Observations	947,633	947,633	947,633	278,451
Canned Tuna	Coefficient (Std.)	0.037*** (0.0052)	0.0266*** (0.0044)	0.0225*** (0.0041)	0.0334*** (0.0047)
	Observations	375,343	375,343	375,343	116,170
Cereals	Coefficient (Std.)	0.0216*** (0.0026)	0.0168*** (0.0023)	0.0156*** (0.0024)	0.0263*** (0.0035)
	Observations	724,232	724,232	724,232	260,035
Cheese	Coefficient (Std.)	0.0374*** (0.0029)	0.0208*** (0.0022)	0.0168*** (0.0022)	0.0116*** (0.0031)
	Observations	1,811,792	1,811,792	1,811,792	519,225
Cigarettes	Coefficient (Std.)	0.019*** (0.0082)	0.0203*** (0.0068)	0.0197*** (0.0067)	0.0215*** (0.0045)
	Observations	15,862	15,862	15,862	9,593
Cookies	Coefficient (Std.)	0.0429*** (0.0017)	0.0372*** (0.0017)	0.0315*** (0.0015)	0.0542*** (0.0031)
	Observations	1,356,845	1,356,845	1,356,845	229,139
Crackers	Coefficient (Std.)	0.0544*** (0.0033)	0.0431*** (0.0031)	0.0389*** (0.0029)	0.0563*** (0.0061)
	Observations	475,368	475,368	475,368	89,210
Dish Detergent	Coefficient (Std.)	0.0481*** (0.0038)	0.0357*** (0.003)	0.0315*** (0.0029)	0.0417*** (0.0043)
	Observations	401,001	401,001	401,001	95,477
Fabric Softener	Coefficient (Std.)	0.0342*** (0.0038)	0.0245*** (0.0034)	0.0209*** (0.0035)	0.0428*** (0.0049)
	Observations	378,773	378,773	378,773	101,926
Front-End-Candies	Coefficient (Std.)	0.0165*** (0.0039)	0.0091*** (0.0028)	0.0082*** (0.0028)	0.0113*** (0.0031)
	Observations	490,220	490,220	490,220	155,203
Frozen Dinners	Coefficient (Std.)	0.0536*** (0.0027)	0.0408*** (0.0025)	0.0394*** (0.0025)	0.0907*** (0.006)
	Observations	502,792	502,792	502,792	72,693

Table A2. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0354*** (0.0019)	0.0301*** (0.0017)	0.0292*** (0.0017)	0.0602*** (0.0032)
	Observations	1,848,166	1,848,166	1,848,166	353,120
Frozen Juices	Coefficient (Std.)	0.0342*** (0.0037)	0.0253*** (0.0031)	0.0227*** (0.003)	0.03*** (0.0048)
	Observations	659,295	659,295	659,295	150,129
Grooming Products	Coefficient (Std.)	0.0426*** (0.0024)	0.0455*** (0.0022)	0.039*** (0.0021)	0.0673*** (0.0061)
	Observations	668,809	668,809	668,809	99,252
Laundry Detergents	Coefficient (Std.)	0.0185*** (0.0031)	0.0155*** (0.0027)	0.0126*** (0.0025)	0.0264*** (0.0047)
	Observations	594,247	594,247	594,247	145,167
Oatmeal	Coefficient (Std.)	0.0288*** (0.0071)	0.0172*** (0.0052)	0.0151*** (0.0052)	0.0319*** (0.0094)
	Observations	168,988	168,988	168,988	63,575
Paper Towels	Coefficient (Std.)	0.0376*** (0.0114)	0.0296*** (0.0116)	0.0284*** (0.0117)	0.0376*** (0.0096)
	Observations	244,037	244,037	244,037	52,321
Refrigerated Juices	Coefficient (Std.)	0.031*** (0.0032)	0.0209*** (0.0027)	0.0182*** (0.0026)	0.0305*** (0.0041)
	Observations	800,176	800,176	800,176	161,074
Shampoos	Coefficient (Std.)	0.0323*** (0.0014)	0.0368*** (0.0014)	0.032*** (0.0013)	0.0674*** (0.0043)
	Observations	713,652	713,652	713,652	86,458
Snack Crackers	Coefficient (Std.)	0.0435*** (0.0032)	0.0382*** (0.003)	0.0338*** (0.0027)	0.066*** (0.004)
	Observations	801,599	801,599	801,599	143,154
Soaps	Coefficient (Std.)	0.0306*** (0.0014)	0.0265*** (0.001)	0.0223*** (0.0009)	0.0586*** (0.0027)
	Observations	4,372,346	4,372,346	4,372,346	346,106
Soft Drinks	Coefficient (Std.)	0.0545*** (0.006)	0.0413*** (0.0044)	0.0336*** (0.0042)	0.0555*** (0.0057)
	Observations	333,170	333,170	333,170	94,295
Toothbrushes	Coefficient (Std.)	0.0291*** (0.0032)	0.0317*** (0.0034)	0.0265*** (0.0032)	0.0618*** (0.006)
	Observations	295,275	295,275	295,275	44,690
Toothpastes	Coefficient (Std.)	0.0289*** (0.0032)	0.028*** (0.0027)	0.0241*** (0.0026)	0.0561*** (0.0063)
	Observations	596,900	596,900	596,900	91,759
Average coefficients		**0.0356**	**0.0288**	**0.0254**	**0.0461**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or equal to 10¢, and 0 otherwise. We exclude observations on price changes if Dominick's sales flag indicates a coupon sale in either week t or $t-1$. The main independent variable is the log of the average sales volume of product i in store s over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and fixed effects for months, years, stores, and products. In column 2, we add the following controls: the natural log of the average price, the natural log of the absolute change in the wholesale price, and control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix B. Alternative definitions of small price changes

In the paper, we define a small price change as a price change smaller than or equal to 10¢. In this appendix, we repeat our main analyses using 8 alternative definitions of small price changes. First, we define small price changes as (1) price changes up to, and including, 5¢, (2) price changes up to, and including, 15¢, (3) price changes up to, and including 2%, and (4) price changes up to, and including, 5%.

Second, we follow Midrigan (2011) and Bhattarai and Schoenle (2014) to define small price changes relative to the average price change in the corresponding category. I.e., a price change is small if it is smaller than or equal to $\kappa\left|\overline{\Delta p_{i,s}}\right|$, where $\overline{\Delta p_{i,s}}$ is the average price change of product i in store s, and κ attains the values 0.5, 0.33, 0.25 and 0.10.

As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t* + 1 and the post-change price remained unchanged for at least 2 weeks.

Table B1 presents the results of regressions equivalent to the regressions in Table 3 in the paper. The regressions take the following form:

$$\begin{aligned} small\ price\ change_{i,s,t} &= \alpha + \beta \ln(average\ sales\ volume_{i,s}) + \gamma \mathbf{X}_{i,s,t} \\ &+ month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \end{aligned} \quad \text{(B1)}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 5¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product.

The values in the table are the coefficients of the log of the average sales volume. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 28 of the coefficients of the log of the average sales volume are positive, 16 of them are statistically significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). 27 of the coefficients are positive, 13 of the 27 are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.007, suggesting that a 1% increase in the sales volume is associated with a 0.7% increase in the likelihood of a small price change.

In column 3, we also add control for 9-ending prices. 27 of the coefficients are positive, 14 of them statistically significant, and 3 more are marginally statistically significant. The average coefficient is 0.008, suggesting that a 1% increase in the sales volume is associated with a 0.8% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. We find that 28 coefficients are positive. 20 of the positive coefficients are statistically significant, and 2 more are statistically significant at the 10% level. The average coefficient is 0.019, suggesting that a 1% increase in the sales volume is associated with a 1.9% increase in the likelihood of a small price change.

Table B2 presents the results of similar regressions, where we define small price changes as price changes of up to, and including, 15¢. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 26 of the coefficients of the log of the average sales volume are positive. 17 of the 26 are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.016, suggesting that a 1% increase in the sales volume is associated with a 1.6% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). 25 of the coefficients are positive. 13 of the positive coefficients are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.012, suggesting that a 1% increase in the sales volume is associated with a 1.2% increase in the likelihood of a small price change.

In column 3, we also add control for 9-ending prices. 25 of the coefficients are positive. 13 of the positive coefficients are statistically significant, and 5 more are marginally statistically significant. The average coefficient is 0.012, suggesting that a 1% increase in the sales volume is associated with a 1.2% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. 26 of the coefficients are positive. 17 of the 26 are statistically significant, and 2 more are statistically significant at the 10% level. The average coefficient is 0.019, suggesting that a 1% increase in the sales volume is associated with a 1.9% increase in the likelihood of a small price change.

Table B3 presents the results where we define small price changes as price changes of up to 2%. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 27 of the 29 coefficients of the log of the average sales volume are positive. Out of the 27, 20 are statistically significant, and 3 more are statistically significant at the 10% level. The average coefficient is 0.009, suggesting that a 1% increase in the sales volume is associated with a 0.9% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). We find that 27 of the 29 coefficients are positive. 17 of the 27 are statistically significant, and 6 more are statistically significant at the 10% level. The average coefficient is 0.007, suggesting that a 1% increase in the sales volume is associated with a 0.7% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. 27 of the 29 coefficients are still positive. 17 of the 27 are statistically significant, and 5 more are statistically significant at the 10% level. The average coefficient is 0.007, suggesting that a 1% increase in the sales volume is associated with a 0.7% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, 28 of the 29 coefficients are positive. 17 of the positive coefficients are statistically significant, and 3 more are marginally statistically significant. The average coefficient is 0.015, suggesting that a 1% increase in the sales volume is associated with a 1.5% increase in the likelihood of a small price change.

Table B4 presents the results where we define small price changes as price changes up to 5%. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 23 coefficients of the log of the average sales volume are positive. 17 of them are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.015, suggesting that a 1% increase in the sales volume is associated with a 1.5% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). 23 of the coefficients are positive. 15 of the positive coefficients are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. 23 of the coefficients are positive. 15 of the 23 are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, 28 of the coefficients are positive. 16 of the 28 are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.021, suggesting that a 1% increase in the sales volume is associated with a 2.1% increase in the likelihood of a small price change.

Table B5 presents the results where we define small price changes as price changes of up to 50% of the average price change of the product-store. In other words, a price change, $\Delta p_{i,s,t}$, of product i in store s in week t is small if $|\Delta p_{i,s,t}| \leq 0.50|\overline{\Delta p}_{i,s}|$, where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s. In column 1, the only control variables are the log of the average sales volume, and dummies for months, years, stores, and products. We find that 26 of the coefficients are positive. 22 of the positive coefficients are statistically significant, and 1 more is marginally statistically significant. The average coefficient is 0.021, suggesting that a 1% increase in the sales volume is associated with a 2.1% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). We find that 26 of the coefficients are positive. 18 of the 26 are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.020, suggesting that a 1% increase in the sales volume is associated with a 2.0% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. We find that 27 of the coefficients are positive. 18 of the 27 are statistically significant, and 2 more are marginally statistically significant. The average coefficient is 0.020, suggesting that a 1% increase in the sales volume is associated with a 2.0% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, 28 of the 29 are statistically significant. 23 of the positive coefficients are statistically significant, and 3 more are marginally significant. The average coefficient is 0.041, suggesting that a 1% increase in the sales volume is associated with a 4.1% increase in the likelihood of a small price change.

Table B6 presents the results where we define small price changes as price changes up to 33% of the average price in the category. In other words, a price change, $\Delta p_{i,s,t}$, of product i in store s in week t is small if $|\Delta p_{i,s,t}| \leq 0.33|\overline{\Delta p}_{i,s}|$, where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s. In column 1, the only control variables are the log of the average sales volume, and dummies for months, years, stores, and products. We find that 27 of the 29 coefficients of the log of the average sales volume are positive.

22 of them are statistically significant, and 2 more is marginally significant. The average coefficient is 0.016, suggesting that a 1% increase in the sales volume is associated with a 1.6% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). We find that 27 of the 29 coefficients are positive. 18 of them are statistically significant, and 3 more are marginally significant. The average coefficient is 0.015, suggesting that a 1% increase in the sales volume is associated with a 1.5% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. We find that 27 of the 29 coefficients are positive. 18 of them are statistically significant, and 3 more are marginally significant. The average coefficient is 0.015, suggesting that a 1% increase in the sales volume is associated with a 1.5% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. We find that all the coefficients are positive and 23 of them are statistically significant. 3 more coefficients are marginally significant. The average coefficient is 0.031, suggesting that a 1% increase in the sales volume is associated with a 3.1% increase in the likelihood of a small price change.

Table B7 presents the results where we define small price changes as price changes up to 25% of the average price in the category. In other words, a price change, $\Delta p_{i,s,t}$, of product i in store s in week t is small if $|\Delta p_{i,s,t}| \leq 0.25|\overline{\Delta p}_{i,s}|$, where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 28 of the 29 coefficients of the log of the average sales volume are positive. 22 of them are statistically significant, and 1 more is marginally significant. The average coefficient is 0.013, suggesting that a 1% increase in the sales volume is associated with a 1.3% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). We find that 27 of the 29 coefficients are positive. 22 of them are statistically significant. The average coefficient is 0.012, suggesting that a 1% increase in the sales volume is associated with a 1.2% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. We find that 27 of the 29 coefficients are positive. 22 of them are statistically significant. The average coefficient is 0.012, suggesting that a 1% increase in the sales volume is associated with a 1.2% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. We find that all the coefficients are positive and 25 of them are statistically significant at the 1% level. One more coefficient is marginally significant. The average coefficient is 0.025, suggesting that a 1% increase in the sales volume is associated with a 2.5% increase in the likelihood of a small price change.

Table B8 presents the results where we define small price changes as price changes up to 10% of the average price in the category. In other words, a price change, $\Delta p_{i,s,t}$, of product i in store s in week t is small if $|\Delta p_{i,s,t}| \leq 0.10|\overline{\Delta p}_{i,s}|$, where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 24 of the 29 coefficients of the log of the average sales volume are positive. 19 of them are statistically significant, and 2 more are marginally significant. The average coefficient is 0.004, suggesting that a 1% increase in the sales volume is associated with a 0.4% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). We find that 25 of the 29 coefficients are positive. 20 of them are statistically significant, and 2 more are marginally significant. The average coefficient is 0.005, suggesting that a 1% increase in the sales volume is associated with a 0.5% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. We find that 25 of the 29 coefficients are positive. 20 of them are statistically significant, and 2 more are marginally significant. The average coefficient is 0.005, suggesting that a 1% increase in the sales volume is associated with a 0.5% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. We find that 25 of the coefficients are positive. 20 of them are statistically significant, and 3 more are marginally significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

Table B1. Category-level regressions of small price changes $(\Delta P \leq 5¢)$ and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0033 (0.0023)	0.0022 (0.0022)	0.0019 (0.0022)	0.0068 (0.0056)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0128** (0.0053)	0.0114** (0.0051)	0.0113** (0.0044)	0.0198 (0.0129)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.0481*** (0.0079)	0.0235*** (0.0066)	0.0233*** (0.0063)	0.0466*** (0.0074)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0003 (0.0002)	0.0005** (0.0002)	0.0005** (0.0002)	0.0051** (0.0021)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.0067 (0.0068)	0.0017 (0.0059)	0.0017 (0.006)	0.0398*** (0.0079)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	0.0055 (0.0086)	0.0028 (0.0084)	0.0052 (0.0082)	0.0148* (0.0078)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0097** (0.0047)	0.004 (0.0045)	0.0039 (0.0045)	0.0201*** (0.0064)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	0.0042 (0.0036)	0.0045 (0.0034)	0.0045 (0.0033)	0.019*** (0.0059)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0004 (0.0029)	-0.0001 (0.0023)	-0.0003 (0.0023)	0.018*** (0.0051)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	0.0114*** (0.0021)	0.0107*** (0.0021)	0.0108*** (0.0021)	0.0114*** (0.0025)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0043*** (0.001)	0.0037*** (0.001)	0.0036*** (0.001)	0.0149*** (0.0026)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0006 (0.0016)	0.0001 (0.0016)	0.0002 (0.0016)	0.0141*** (0.0044)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0175*** (0.003)	0.0123*** (0.0026)	0.0126*** (0.0024)	0.0289*** (0.0052)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.01** (0.0044)	0.0027 (0.0039)	0.0032 (0.0039)	0.0157** (0.0079)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	-0.0038 (0.0034)	-0.0046 (0.0031)	-0.0045 (0.0031)	0.0011 (0.0028)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0252*** (0.0061)	0.0186*** (0.0052)	0.0198*** (0.0051)	0.0524*** (0.012)
	Observations	52,893	52,893	52,893	12,287

Table B1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0132*** (0.0022)	0.0123*** (0.0019)	0.0125*** (0.0019)	0.0294*** (0.0028)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0185*** (0.0051)	0.0162*** (0.0044)	0.0168*** (0.0044)	0.0249*** (0.0073)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0028** (0.0011)	0.0029*** (0.0011)	0.0031*** (0.0011)	0.0058 (0.0039)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.0053** (0.0024)	0.0024 (0.0022)	0.0027 (0.0022)	0.0073* (0.0042)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	0.0421*** (0.0139)	0.0327*** (0.011)	0.0308*** (0.0104)	0.0564*** (0.0153)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0113 (0.0101)	0.0095 (0.0097)	0.0107 (0.0095)	-0.006 (0.0108)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.018*** (0.0054)	0.0104* (0.0057)	0.0104* (0.0056)	0.0267** (0.0108)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0007 (0.0006)	0.0008 (0.0006)	0.0008 (0.0006)	0.0038 (0.0023)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	0.0018 (0.0013)	0.0024* (0.0013)	0.0025** (0.0013)	0.0131*** (0.0034)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0216*** (0.0084)	0.0125 (0.0082)	0.0157** (0.0079)	0.0473*** (0.0109)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0026 (0.0018)	0.006*** (0.0015)	0.0048*** (0.0015)	0.0005 (0.0027)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0066** (0.0026)	0.0059** (0.0026)	0.0057** (0.0025)	0.0121** (0.0059)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0036 (0.0026)	0.0036 (0.0023)	0.0038* (0.0022)	0.0145*** (0.0055)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0105**	**0.0073**	**0.0075**	**0.0195**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 5¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table B2. Category-level regressions of small price changes ($\Delta P \leq 15¢$) and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0177*** (0.0052)	0.0127*** (0.0049)	0.0118*** (0.0049)	0.0078* (0.0091)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0349** (0.0189)	0.0296** (0.0179)	0.0295** (0.0177)	0.018 (0.0348)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.0592*** (0.01)	0.0333*** (0.0092)	0.0332*** (0.0094)	0.0323*** (0.0084)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0018*** (0.0006)	0.0042*** (0.0007)	0.0042*** (0.0007)	0.0219*** (0.0052)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.015*** (0.0069)	0.0108** (0.006)	0.0109** (0.0058)	0.0161** (0.0088)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	-0.0049* (0.0056)	-0.0057* (0.0056)	-0.0044 (0.0054)	0.0009 (0.0035)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0084* (0.0077)	-0.0021 (0.0066)	-0.0022 (0.0066)	0.0098* (0.0077)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	0.0054* (0.0058)	0.0052* (0.0053)	0.0052* (0.0053)	0.0071* (0.0061)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0055** (0.0042)	0.0052** (0.0037)	0.0052** (0.0037)	0.0104*** (0.0039)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	0.0008 (0.0046)	0 (0.0047)	0.0001 (0.0047)	-0.0025 (0.005)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0117*** (0.0025)	0.0103*** (0.0024)	0.01*** (0.0023)	0.016*** (0.0043)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0081*** (0.0032)	0.0081*** (0.003)	0.0083*** (0.0029)	0.0131*** (0.0053)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0257*** (0.0054)	0.0194*** (0.0045)	0.0194*** (0.0045)	0.0219*** (0.0057)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0138** (0.0086)	0.0032 (0.0077)	0.0035 (0.0077)	0.0176*** (0.0086)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	-0.0027 (0.0047)	-0.0025 (0.0034)	-0.0024 (0.0034)	-0.0012 (0.003)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0434*** (0.0076)	0.0362*** (0.0069)	0.0354*** (0.0068)	0.0729*** (0.0108)
	Observations	52,893	52,893	52,893	12,287

Table B2. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0209*** (0.0032)	0.0202*** (0.0029)	0.0202*** (0.0029)	0.0141*** (0.0037)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0177** (0.0093)	0.0163** (0.009)	0.0166** (0.009)	0.0004 (0.0091)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0127*** (0.0039)	0.015*** (0.0038)	0.015*** (0.0038)	0.0203** (0.0118)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.0302*** (0.0055)	0.0192*** (0.0048)	0.0195*** (0.0048)	0.013*** (0.0058)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	0.0419*** (0.0152)	0.0366*** (0.0146)	0.037*** (0.0147)	0.0433*** (0.0171)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.014 (0.0168)	0.0084 (0.0176)	0.0084 (0.0175)	0.0279*** (0.0131)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0236*** (0.0069)	0.013** (0.007)	0.0131** (0.0071)	0.0283*** (0.009)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0279*** (0.004)	0.0278*** (0.0038)	0.0278*** (0.0038)	0.0424*** (0.0114)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	-0.0041** (0.0034)	-0.0033** (0.0034)	-0.0031* (0.0034)	0.0044 (0.0057)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0169*** (0.0077)	0.007** (0.007)	0.0094** (0.0071)	0.0335*** (0.0113)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0079*** (0.0026)	0.0099*** (0.0025)	0.0096*** (0.0025)	-0.0003 (0.004)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0182*** (0.0061)	0.0119** (0.0062)	0.0113** (0.0061)	0.0385*** (0.013)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0024 (0.0062)	0.0005 (0.0059)	0.0009 (0.0058)	0.0172** (0.0088)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0163**	**0.0121**	**0.0122**	**0.0188**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 15¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table B3. Category-level regressions of small price changes ($\Delta P \leq 2\%$) and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0097*** (0.0034)	0.0058** (0.003)	0.0054** (0.003)	0.0132** (0.0072)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0093** (0.0054)	0.0085** (0.0049)	0.0084** (0.0046)	0.0004 (0.0127)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.022*** (0.0054)	0.0095*** (0.0044)	0.0095*** (0.0043)	0.015** (0.0082)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0017*** (0.0004)	0.0034*** (0.0006)	0.0034*** (0.0006)	0.0196*** (0.004)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.0115*** (0.0039)	0.0068*** (0.0032)	0.0068*** (0.0031)	0.0237*** (0.0095)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	-0.0032* (0.0031)	-0.0038** (0.0028)	-0.0034** (0.0028)	-0.0061* (0.006)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0069*** (0.0026)	0.0038** (0.0023)	0.0038** (0.0023)	0.0072* (0.0063)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	0.01*** (0.0039)	0.011*** (0.0033)	0.011*** (0.0033)	0.0237*** (0.0063)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0051** (0.0027)	0.0043*** (0.002)	0.0042*** (0.002)	0.0149*** (0.0048)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	0.0041** (0.0026)	0.0049** (0.0026)	0.0049** (0.0026)	0.0073*** (0.0029)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0032*** (0.0008)	0.0025*** (0.0007)	0.0025*** (0.0007)	0.0073*** (0.0022)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0015** (0.0008)	0.0011** (0.0008)	0.0012** (0.0008)	0.0028* (0.0031)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0139*** (0.0022)	0.009*** (0.0018)	0.0091*** (0.0018)	0.0233*** (0.0047)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0104*** (0.004)	0.0035* (0.0033)	0.0037* (0.0033)	0.0082* (0.0078)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	-0.002** (0.0012)	-0.002** (0.0011)	-0.0021** (0.0011)	0.0009 (0.0015)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0227*** (0.005)	0.0156*** (0.0038)	0.0162*** (0.0037)	0.0246*** (0.0091)
	Observations	52,893	52,893	52,893	12,287

Table B3. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0097*** (0.0018)	0.0092*** (0.0016)	0.0093*** (0.0015)	0.0266*** (0.0027)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0152*** (0.0035)	0.0131*** (0.003)	0.0131*** (0.003)	0.0206*** (0.0068)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0026* (0.0023)	0.0031** (0.0023)	0.0033** (0.0023)	0.0048 (0.0086)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.019*** (0.0044)	0.0101*** (0.003)	0.0105*** (0.003)	0.0116** (0.0059)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	0.0428*** (0.0153)	0.0314*** (0.0105)	0.0303*** (0.0102)	0.0511*** (0.0141)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0053** (0.0037)	0.0066** (0.0035)	0.0068** (0.0035)	0.0255** (0.0147)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0156*** (0.0038)	0.0082*** (0.0029)	0.0082*** (0.0029)	0.0212*** (0.0081)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0022*** (0.0011)	0.0025*** (0.0011)	0.0025*** (0.0011)	0.0127*** (0.0052)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	0.0005 (0.0009)	0.0008* (0.0009)	0.0008* (0.0009)	0.0035* (0.0028)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.019*** (0.0059)	0.0088** (0.0048)	0.0101** (0.0048)	0.0273*** (0.0111)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0017*** (0.0008)	0.0015** (0.0008)	0.0012** (0.0008)	0.0003 (0.0027)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0056*** (0.0022)	0.0044*** (0.0021)	0.0044*** (0.0021)	0.0166*** (0.0066)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0066*** (0.0021)	0.0054*** (0.0019)	0.0056*** (0.0019)	0.0157*** (0.0055)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0094**	**0.0065**	**0.0066**	**0.0146**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 2%, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table B4. Category-level regressions of small price changes $(\Delta P \leq 5\%)$ and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0266*** (0.0065)	0.0214*** (0.0061)	0.0204*** (0.0061)	0.0135** (0.0103)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0207** (0.0148)	0.0144* (0.0135)	0.0144* (0.0134)	0.0176 (0.0329)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.0236*** (0.009)	0.0005 (0.0081)	0.0003 (0.0082)	0.0048 (0.0091)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0066*** (0.0015)	0.0115*** (0.0016)	0.0115*** (0.0016)	0.0444*** (0.0069)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	-0.0025 (0.0071)	-0.0068* (0.0064)	-0.0067* (0.0066)	0.0195*** (0.0075)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	-0.0201** (0.0114)	-0.0226** (0.0111)	-0.0202** (0.011)	0.0133** (0.0086)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	-0.0021 (0.0058)	-0.0064* (0.0057)	-0.0065* (0.0057)	0.0129** (0.0088)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	-0.0003 (0.0076)	-0.0001 (0.0073)	0 (0.0073)	0.014** (0.0073)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0047* (0.0037)	0.0043* (0.0034)	0.004* (0.0034)	0.0126*** (0.0044)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	-0.0007 (0.004)	-0.0037* (0.0039)	-0.0038* (0.004)	-0.0062** (0.0046)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0109*** (0.002)	0.0097*** (0.0021)	0.0096*** (0.002)	0.0102*** (0.0036)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0024 (0.003)	0.0015 (0.003)	0.0019 (0.003)	0.0147*** (0.0061)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0308*** (0.0049)	0.0249*** (0.0042)	0.025*** (0.0041)	0.0256*** (0.0055)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0207*** (0.0079)	0.0104** (0.0069)	0.011** (0.0069)	0.0232*** (0.0082)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	-0.0033** (0.0026)	-0.0033** (0.0025)	-0.0033** (0.0025)	0.0015 (0.0023)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0385*** (0.0071)	0.0296*** (0.0065)	0.0295*** (0.0065)	0.0684*** (0.0099)
	Observations	52,893	52,893	52,893	12,287

Table B4. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0186*** (0.0029)	0.0196*** (0.0026)	0.0197*** (0.0026)	0.0249*** (0.0035)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0244*** (0.0057)	0.0224*** (0.005)	0.0233*** (0.0048)	0.0323*** (0.0071)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0091*** (0.0038)	0.0104*** (0.0039)	0.0106*** (0.004)	0.0154** (0.0097)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.0273*** (0.006)	0.0153*** (0.0052)	0.0159*** (0.0052)	0.0119** (0.0063)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	0.0424*** (0.0138)	0.0367*** (0.0135)	0.0362*** (0.0133)	0.0536*** (0.0115)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0232** (0.0126)	0.0226** (0.0117)	0.0232** (0.0115)	0.01 (0.0167)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0264*** (0.0065)	0.0187*** (0.0064)	0.0187*** (0.0064)	0.0223** (0.0116)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0176*** (0.0029)	0.0185*** (0.0029)	0.0185*** (0.0029)	0.0318*** (0.0089)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	0.0028* (0.0026)	0.0035** (0.0026)	0.0035** (0.0026)	0.0173*** (0.0047)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0295*** (0.009)	0.0182*** (0.0085)	0.0212*** (0.0084)	0.0509*** (0.0102)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0029*** (0.0013)	0.0028*** (0.0012)	0.0023** (0.0012)	0.0012** (0.0033)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0141*** (0.0059)	0.0108** (0.006)	0.0103** (0.006)	0.0314*** (0.0119)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0083** (0.0043)	0.0082** (0.004)	0.0084*** (0.004)	0.0225*** (0.0083)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0139**	**0.0101**	**0.0103**	**0.0212**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 5%, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table B5. Category-level regressions of small price changes ($\Delta P \leq 50\%$ of the average price change) and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0374*** (0.0074)	0.032*** (0.007)	0.0314*** (0.007)	0.0563*** (0.0108)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0503*** (0.0138)	0.0433*** (0.0137)	0.0432*** (0.0136)	0.1405*** (0.0357)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.0184*** (0.0058)	0.0175*** (0.0068)	0.0174*** (0.0068)	0.0405*** (0.0097)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0057*** (0.0015)	0.012*** (0.0014)	0.012*** (0.0014)	0.0648*** (0.0084)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.0132*** (0.0053)	0.01** (0.0054)	0.0101** (0.0054)	0.0193*** (0.0087)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	-0.0043 (0.0066)	-0.0003 (0.0069)	0.0017 (0.0068)	0.0129** (0.0073)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0125*** (0.0048)	0.0118*** (0.0048)	0.0116*** (0.0049)	0.0222*** (0.0074)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	-0.0018 (0.0046)	-0.0012 (0.0048)	-0.0011 (0.0048)	0.0082* (0.0074)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0078*** (0.0036)	0.0066** (0.004)	0.0065** (0.004)	0.0158*** (0.0059)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	0.107*** (0.0084)	0.1075*** (0.0081)	0.1075*** (0.0081)	0.1225*** (0.009)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0153*** (0.0031)	0.0127*** (0.0031)	0.0126*** (0.0031)	0.0367*** (0.006)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0152*** (0.0049)	0.0138*** (0.005)	0.0139*** (0.005)	0.0253*** (0.0078)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0092*** (0.0042)	0.004* (0.0041)	0.0042* (0.0042)	0.0137** (0.0072)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0125** (0.0065)	0.0088** (0.0065)	0.0093** (0.0066)	0.0317*** (0.0102)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	0.0199*** (0.0052)	0.0239*** (0.0052)	0.0241*** (0.0052)	0.0128*** (0.0043)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0285*** (0.0079)	0.0312*** (0.0085)	0.0305*** (0.0084)	0.0678*** (0.0128)
	Observations	52,893	52,893	52,893	12,287

Table B5. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0286*** (0.0032)	0.0377*** (0.0034)	0.0375*** (0.0034)	0.0308*** (0.0036)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0143*** (0.0066)	0.0125** (0.0076)	0.013** (0.0077)	0.0229*** (0.0103)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0417*** (0.0037)	0.0435*** (0.0038)	0.0434*** (0.0038)	0.0797*** (0.009)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.0159*** (0.0044)	0.0113*** (0.004)	0.0117*** (0.004)	0.0198*** (0.0066)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	-0.0063 (0.0101)	-0.0135* (0.012)	-0.0133* (0.012)	0.0112 (0.0167)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0111** (0.0071)	0.0161*** (0.0071)	0.0167*** (0.0071)	-0.004 (0.0188)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0068** (0.0049)	0.0034 (0.0052)	0.0034 (0.0052)	0.0211** (0.0113)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0522*** (0.0035)	0.0521*** (0.0035)	0.0521*** (0.0035)	0.1111*** (0.0112)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	0.0048* (0.0048)	0.0007 (0.0052)	0.0008 (0.0052)	0.0215*** (0.0063)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0137*** (0.0067)	0.0049 (0.0069)	0.0077* (0.007)	0.0332*** (0.0118)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0137*** (0.0022)	0.0119*** (0.0024)	0.0122*** (0.0024)	0.0152*** (0.0043)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0445*** (0.0058)	0.0394*** (0.0055)	0.0387*** (0.0056)	0.0881*** (0.0125)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0287*** (0.0046)	0.0287*** (0.0047)	0.0288*** (0.0047)	0.0613*** (0.0092)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0213**	**0.0201**	**0.0203**	**0.0415**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to $0.5\left|\overline{\Delta p}_{i,s}\right|$ where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table B6. Category-level regressions of small price changes ($\Delta P \leq 33\%$ of the average price change) and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0293*** (0.0045)	0.0248*** (0.0043)	0.0242*** (0.0042)	0.0414*** (0.0088)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0304*** (0.0113)	0.026*** (0.0107)	0.026*** (0.0105)	0.0736*** (0.0225)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.0057* (0.005)	0.0107** (0.0064)	0.0106** (0.0064)	0.0297*** (0.0123)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0023*** (0.0006)	0.0065*** (0.0008)	0.0064*** (0.0008)	0.0526*** (0.0069)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.0184*** (0.0041)	0.0157*** (0.0044)	0.0157*** (0.0044)	0.0183*** (0.0081)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	-0.0072* (0.0057)	-0.0028 (0.006)	-0.0014 (0.0058)	0.0121** (0.0073)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0102*** (0.0036)	0.0082*** (0.0032)	0.0081*** (0.0032)	0.0161*** (0.0063)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	0.0081*** (0.0039)	0.0088*** (0.004)	0.0088*** (0.004)	0.0163*** (0.0069)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0078*** (0.0033)	0.0068** (0.0035)	0.0068** (0.0035)	0.0142*** (0.0061)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	0.0476*** (0.0061)	0.0492*** (0.0059)	0.0493*** (0.0058)	0.0588*** (0.0065)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0121*** (0.0023)	0.0103*** (0.0025)	0.0102*** (0.0024)	0.0148*** (0.0043)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0104*** (0.0041)	0.0092*** (0.0041)	0.0093*** (0.0041)	0.0195*** (0.006)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0073*** (0.0028)	0.0034** (0.0029)	0.0036* (0.0029)	0.0181*** (0.0048)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0098** (0.0061)	0.0066** (0.0059)	0.0069* (0.006)	0.033*** (0.0097)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	0.0107*** (0.0046)	0.0132*** (0.0045)	0.0134*** (0.0045)	0.0115*** (0.0039)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0312*** (0.0078)	0.0339*** (0.0087)	0.0339*** (0.0086)	0.0534*** (0.0144)
	Observations	52,893	52,893	52,893	12,287

Table B6. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0332*** (0.003)	0.0405*** (0.0031)	0.0404*** (0.0031)	0.0311*** (0.0034)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0251*** (0.0067)	0.0228*** (0.0076)	0.0232*** (0.0077)	0.0289*** (0.009)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0279*** (0.0031)	0.029*** (0.003)	0.0291*** (0.003)	0.0645*** (0.008)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.0092*** (0.0033)	0.005** (0.0032)	0.0053** (0.0032)	0.0104** (0.0057)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	-0.0023 (0.0102)	-0.0087 (0.0121)	-0.0094 (0.012)	0.0159* (0.0172)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0122** (0.009)	0.0174** (0.0092)	0.0179** (0.0092)	0.0161** (0.0151)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0095** (0.005)	0.0061* (0.0049)	0.0061* (0.0048)	0.0122** (0.0126)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0328*** (0.0027)	0.0325*** (0.0026)	0.0325*** (0.0026)	0.0829*** (0.0094)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	0.0037* (0.0039)	0.0001 (0.0042)	0.0002 (0.0042)	0.0177*** (0.0047)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0143*** (0.0055)	0.0083** (0.0056)	0.01** (0.0057)	0.0216** (0.0121)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0143*** (0.0021)	0.0121*** (0.0024)	0.0119*** (0.0024)	0.0137*** (0.0031)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0277*** (0.0043)	0.0238*** (0.0041)	0.0234*** (0.0041)	0.0611*** (0.0108)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0211*** (0.0034)	0.0204*** (0.0035)	0.0205*** (0.0035)	0.0425*** (0.0078)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0160**	**0.0152**	**0.0153**	**0.0311**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or to $0.33\left|\overline{\Delta p}_{i,s}\right|$ where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table B7. Category-level regressions of small price changes ($\Delta P \leq 25\%$ of the average price change) and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0211*** (0.0035)	0.0177*** (0.0032)	0.0172*** (0.0032)	0.0337*** (0.0074)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0209*** (0.0083)	0.0177*** (0.0077)	0.0176*** (0.0074)	0.0616*** (0.0241)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.0036 (0.005)	0.012*** (0.0057)	0.0119*** (0.0057)	0.028*** (0.0127)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0025*** (0.0006)	0.0054*** (0.0007)	0.0054*** (0.0007)	0.0377*** (0.0059)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.016*** (0.004)	0.0134*** (0.0041)	0.0135*** (0.0041)	0.0221*** (0.0071)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	-0.0121** (0.0062)	-0.0077* (0.0065)	-0.0064* (0.0064)	0.0152*** (0.0065)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0089*** (0.0037)	0.0066*** (0.0031)	0.0065*** (0.0031)	0.014*** (0.0063)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	0.0105*** (0.0035)	0.0111*** (0.0035)	0.0112*** (0.0034)	0.0195*** (0.0059)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0085*** (0.0029)	0.0077*** (0.0029)	0.0077*** (0.0029)	0.0152*** (0.0053)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	0.0193*** (0.004)	0.0209*** (0.0039)	0.0209*** (0.0039)	0.025*** (0.0045)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0086*** (0.0018)	0.0073*** (0.0019)	0.0072*** (0.0019)	0.0143*** (0.0035)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0045** (0.0025)	0.0038** (0.0026)	0.0038** (0.0025)	0.0068** (0.0041)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0093*** (0.0021)	0.006*** (0.0021)	0.0061*** (0.0021)	0.0183*** (0.0046)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0128*** (0.0044)	0.0098*** (0.0043)	0.0101*** (0.0043)	0.0278*** (0.0087)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	0.0125*** (0.0042)	0.0147*** (0.0042)	0.0148*** (0.0042)	0.0132*** (0.0041)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0373*** (0.0064)	0.0398*** (0.0076)	0.0401*** (0.0075)	0.0586*** (0.0123)
	Observations	52,893	52,893	52,893	12,287

Table B7. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0324*** (0.0032)	0.0389*** (0.0035)	0.0389*** (0.0034)	0.0321*** (0.0039)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0279*** (0.0062)	0.0255*** (0.0068)	0.0259*** (0.0068)	0.0312*** (0.0089)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0149*** (0.0021)	0.0156*** (0.0022)	0.0157*** (0.0022)	0.0368*** (0.0062)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.0013 (0.0025)	-0.0018 (0.0024)	-0.0017 (0.0024)	0.0011 (0.0054)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	0.0065 (0.0082)	0.0011 (0.0095)	-0.0002 (0.0094)	0.0022 (0.0145)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0074 (0.0102)	0.0116* (0.0106)	0.0123* (0.0105)	0.0265** (0.0132)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0094*** (0.0041)	0.006** (0.0041)	0.0061** (0.0041)	0.0151** (0.0108)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.018*** (0.0021)	0.018*** (0.002)	0.018*** (0.002)	0.054*** (0.0077)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	0.0044** (0.0027)	0.0015 (0.0027)	0.0015 (0.0027)	0.0126*** (0.0046)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0184*** (0.005)	0.0138*** (0.005)	0.015*** (0.0051)	0.0251*** (0.0109)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.016*** (0.0026)	0.0136*** (0.0027)	0.0131*** (0.0028)	0.0132*** (0.0032)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0156*** (0.0043)	0.013*** (0.004)	0.0127*** (0.004)	0.0427*** (0.0095)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0178*** (0.0027)	0.0168*** (0.0026)	0.0169*** (0.0026)	0.0315*** (0.007)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0129**	**0.0124**	**0.0125**	**0.0253**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or to $0.25\left|\overline{\Delta p}_{i,s}\right|$ where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s, and 0 otherwise. The main independent variable is the log of the average sales volume of product i in store s over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table B8. Category-level regressions of small price changes ($\Delta P \leq 10\%$ of the average price change) and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0067*** (0.0018)	0.0057*** (0.0017)	0.0055*** (0.0017)	0.0122*** (0.0047)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.005*** (0.0021)	0.0045*** (0.0019)	0.0044*** (0.0019)	-0.0015 (0.0107)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	-0.0058** (0.0029)	0.0069** (0.0039)	0.0069** (0.0039)	0.0207*** (0.0078)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.0015*** (0.0004)	0.0031*** (0.0006)	0.0031*** (0.0006)	0.0191*** (0.004)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.0029** (0.0015)	0.0019* (0.0015)	0.0019* (0.0015)	0.0039* (0.0045)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	0.0001 (0.002)	0.0031** (0.0023)	0.0033** (0.0023)	0.0128*** (0.004)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0032*** (0.0013)	0.0021*** (0.0011)	0.0021** (0.0011)	0.0089*** (0.0029)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	0.0038*** (0.0015)	0.004*** (0.0015)	0.004*** (0.0015)	0.0094*** (0.003)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0018*** (0.0008)	0.0015*** (0.0008)	0.0015** (0.0008)	0.0075*** (0.0026)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	-0.001 (0.0013)	-0.0004 (0.0013)	-0.0004 (0.0013)	-0.0004 (0.0015)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0013*** (0.0005)	0.0012*** (0.0005)	0.0012*** (0.0004)	0.0028*** (0.0011)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	-0.0002 (0.0005)	-0.0003 (0.0005)	-0.0002 (0.0005)	0.0014* (0.0015)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0047*** (0.0013)	0.0036*** (0.0012)	0.0037*** (0.0012)	0.0087*** (0.0033)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0014 (0.0018)	0.0009 (0.0018)	0.001 (0.0018)	0.0034 (0.0055)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	0.0077*** (0.0025)	0.0093*** (0.0028)	0.0093*** (0.0028)	0.0079*** (0.0032)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.028*** (0.0056)	0.0279*** (0.0061)	0.0288*** (0.006)	0.0425*** (0.0124)
	Observations	52,893	52,893	52,893	12,287

Table B8. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0157*** (0.0023)	0.02*** (0.0024)	0.0201*** (0.0024)	0.0322*** (0.0036)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0165*** (0.0041)	0.0149*** (0.0043)	0.0151*** (0.0042)	0.0251*** (0.006)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0013*** (0.0006)	0.0014*** (0.0006)	0.0015*** (0.0006)	0.0031** (0.0022)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	-0.0009 (0.0015)	-0.0016* (0.0014)	-0.0016* (0.0014)	-0.0034* (0.0036)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	0.0032 (0.0042)	0.0014 (0.0042)	0.001 (0.0041)	0.0056 (0.0081)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0058** (0.0034)	0.0062** (0.0034)	0.0065** (0.0034)	0.0143*** (0.0067)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0052*** (0.0014)	0.0033*** (0.0013)	0.0033*** (0.0013)	0.0165*** (0.0054)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0009*** (0.0003)	0.0009*** (0.0003)	0.0009*** (0.0003)	0.0041*** (0.0016)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	-0.0003 (0.0009)	-0.0007 (0.0009)	-0.0007 (0.0009)	0.0024* (0.0019)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0067*** (0.0022)	0.0057*** (0.0021)	0.0059*** (0.0021)	0.0107*** (0.0054)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0022*** (0.0007)	0.0014*** (0.0007)	0.0008* (0.0007)	-0.002* (0.0021)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.0053*** (0.0013)	0.0047*** (0.0013)	0.0046*** (0.0013)	0.0119*** (0.004)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0048*** (0.001)	0.0046*** (0.001)	0.0047*** (0.001)	0.0123*** (0.0032)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0044**	**0.0047**	**0.0048**	**0.0101**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or to $0.10|\overline{\Delta p}_{i,s}|$ where $\overline{\Delta p}_{i,s}$ is the average size of a price change of product i in store s, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix C. Using all price changes

In the paper, we use observations on price changes only if we observe the price in both week t and t+1 and the post change price remained unchanged for at least 2 weeks. In this appendix, we re-run the regressions we report in Table 3 in the paper, but this time: (1) using observations if we observe the price in both week t and t +1 and (2) using observations on all price changes. As in the paper, we define small price changes as price changes smaller than, or equal to, 10¢.

Table C1 presents the results of regressions equivalent to the regressions in Table 3 in the paper. The regressions take the following form:

$$\begin{aligned} small\ price\ change_{i,s,t} &= \alpha + \beta \ln(average\ sales\ volume_{i,s}) + \gamma \mathbf{X}_{i,s,t} \\ &+ month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \end{aligned} \tag{C1}$$

where *small price change* is a dummy that equals 1 if a price change of product i in store s at time t is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product i in store s over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and u is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product. We use all observations on price changes if we observe the price in both week t and week t +1.

The values in the table are the coefficients of the log of the average sales volume. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that all the coefficients of the log of the average sales volume are positive and statistically significant. The average coefficient is 0.030, suggesting that a 1% increase in the sales volume is associated with a 3.0% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). All the coefficients are positive and statistically significant. The average coefficient is 0.025, suggesting that a 1% increase in the sales volume is associated with a 2.5% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. All the coefficients are still positive and statistically significant. The average coefficient is 0.023, suggesting that a 1% increase in the sales volume is associated with a 2.3% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, the results are even stronger. All the coefficients are positive and statistically significant. The average coefficient is 0.045, suggesting that a 1% increase in the sales volume is associated with a 4.5% increase in the likelihood of a small price change.

Table C2 presents the results when we use observations on all price changes. In column 1, the control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that all the coefficients of the log of the average sales volume are positive and 28 of the 29 are statistically significant at the 1% level. The remaining coefficient is statistically significant at the 10% level. The average coefficient is 0.035, suggesting that a 1% increase in the sales volume is associated with a 3.5% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). All the coefficients are positive and statistically significant at the 1% level. The average coefficient is 0.035, suggesting that a 1% increase in the sales volume is associated with a 3.5% increase in the likelihood of a small price change.

In column 3, we add a control for 9-ending prices. All the coefficients are still positive and statistically significant. The average coefficient is 0.032, suggesting that a 1% increase in the sales volume is associated with a 3.2% increase in the likelihood of a small price change.

As a further control for the effects of sales on the estimation results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, the results are even stronger. All the coefficients are positive and statistically significant. The average coefficient is 0.055, suggesting that a 1% increase in the sales volume is associated with a 5.5% increase in the likelihood of a small price change.

Table C1. Category-level regressions of small price changes and sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0388*** (0.0033)	0.0305*** (0.0027)	0.0248*** (0.0025)	0.0475*** (0.0057)
	Observations	278,052	278,052	278,052	75,945
Bath Soap	Coefficient (Std.)	0.0409*** (0.0093)	0.0452*** (0.0095)	0.0422*** (0.0091)	0.0871*** (0.016)
	Observations	35,795	35,795	35,795	6,555
Bathroom Tissues	Coefficient (Std.)	0.0372*** (0.0056)	0.0203*** (0.0053)	0.0177*** (0.0049)	0.0351*** (0.0069)
	Observations	326,383	326,383	326,383	81,914
Beer	Coefficient (Std.)	0.023*** (0.0015)	0.0249*** (0.0012)	0.0208*** (0.0012)	0.0691*** (0.005)
	Observations	459,669	459,669	459,669	56,427
Bottled Juice	Coefficient (Std.)	0.0554*** (0.0043)	0.0393*** (0.003)	0.0343*** (0.0031)	0.0368*** (0.0045)
	Observations	960,033	960,033	960,033	244,199
Canned Soup	Coefficient (Std.)	0.0272*** (0.004)	0.0151*** (0.0034)	0.0158*** (0.0033)	0.0217*** (0.0038)
	Observations	947,633	947,633	947,633	278,451
Canned Tuna	Coefficient (Std.)	0.037*** (0.0052)	0.0266*** (0.0044)	0.0225*** (0.0041)	0.0334*** (0.0047)
	Observations	375,343	375,343	375,343	116,170
Cereals	Coefficient (Std.)	0.0215*** (0.0026)	0.0168*** (0.0023)	0.0156*** (0.0024)	0.0263*** (0.0035)
	Observations	724,902	724,902	724,902	260,110
Cheese	Coefficient (Std.)	0.0374*** (0.0029)	0.0208*** (0.0022)	0.0169*** (0.0022)	0.0116*** (0.0031)
	Observations	1,812,016	1,812,016	1,812,016	519,361
Cigarettes	Coefficient (Std.)	0.019*** (0.0082)	0.0203*** (0.0068)	0.0197** (0.0067)	0.0215*** (0.0045)
	Observations	15,862	15,862	15,862	9,593
Cookies	Coefficient (Std.)	0.0429*** (0.0017)	0.0372*** (0.0017)	0.0315*** (0.0015)	0.0543*** (0.0031)
	Observations	1,357,300	1,357,300	1,357,300	229,189
Crackers	Coefficient (Std.)	0.0544*** (0.0033)	0.0431*** (0.0031)	0.0389*** (0.0029)	0.0563*** (0.0061)
	Observations	475,497	475,497	475,497	89,212
Dish Detergent	Coefficient (Std.)	0.0481*** (0.0038)	0.0357*** (0.003)	0.0315*** (0.0029)	0.0417*** (0.0043)
	Observations	401,332	401,332	401,332	95,495
Fabric Softener	Coefficient (Std.)	0.0342*** (0.0038)	0.0245*** (0.0034)	0.0209*** (0.0035)	0.0428*** (0.0049)
	Observations	378,836	378,836	378,836	101,979
Front-End-Candies	Coefficient (Std.)	0.0165*** (0.0039)	0.0091** (0.0028)	0.0082** (0.0028)	0.0113*** (0.0032)
	Observations	490,627	490,627	490,627	155,230
Frozen Dinners	Coefficient (Std.)	0.0536*** (0.0027)	0.0408*** (0.0025)	0.0394*** (0.0025)	0.0907*** (0.006)
	Observations	502,792	502,792	502,792	72,693

Table C1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0354*** (0.0019)	0.0301*** (0.0017)	0.0292*** (0.0017)	0.0602*** (0.0032)
	Observations	1,848,187	1,848,187	1,848,187	353,136
Frozen Juices	Coefficient (Std.)	0.0342*** (0.0037)	0.0253*** (0.0031)	0.0227*** (0.003)	0.0299*** (0.0048)
	Observations	659,305	659,305	659,305	150,138
Grooming Products	Coefficient (Std.)	0.0426*** (0.0024)	0.0455*** (0.0022)	0.039*** (0.0021)	0.0673*** (0.0061)
	Observations	668,821	668,821	668,821	99,253
Laundry Detergents	Coefficient (Std.)	0.0185*** (0.0031)	0.0155*** (0.0027)	0.0126*** (0.0025)	0.0264*** (0.0047)
	Observations	594,258	594,258	594,258	145,176
Oatmeal	Coefficient (Std.)	0.0288*** (0.0071)	0.0172*** (0.0052)	0.0151** (0.0052)	0.0319*** (0.0094)
	Observations	168,988	168,988	168,988	63,575
Paper Towels	Coefficient (Std.)	0.0378*** (0.0114)	0.0298*** (0.0116)	0.0285** (0.0117)	0.0376*** (0.0096)
	Observations	244,068	244,068	244,068	52,327
Refrigerated Juices	Coefficient (Std.)	0.031*** (0.0032)	0.0209*** (0.0027)	0.0182*** (0.0026)	0.0305*** (0.0041)
	Observations	800,280	800,280	800,280	161,098
Shampoos	Coefficient (Std.)	0.0323*** (0.0014)	0.0368*** (0.0014)	0.032*** (0.0013)	0.0674*** (0.0043)
	Observations	713,730	713,730	713,730	86,458
Snack Crackers	Coefficient (Std.)	0.0434*** (0.0032)	0.0381*** (0.003)	0.0337*** (0.0027)	0.0661*** (0.004)
	Observations	802,462	802,462	802,462	143,164
Soaps	Coefficient (Std.)	0.0305*** (0.0014)	0.0265*** (0.001)	0.0222*** (0.0009)	0.0585*** (0.0027)
	Observations	4,378,334	4,378,334	4,378,334	346,632
Soft Drinks	Coefficient (Std.)	0.0545*** (0.006)	0.0413*** (0.0044)	0.0336*** (0.0042)	0.0555*** (0.0057)
	Observations	333,170	333,170	333,170	94,295
Toothbrushes	Coefficient (Std.)	0.0291*** (0.0032)	0.0317*** (0.0034)	0.0265*** (0.0032)	0.0619*** (0.006)
	Observations	295,403	295,403	295,403	44,776
Toothpastes	Coefficient (Std.)	0.0289*** (0.0032)	0.028*** (0.0027)	0.0241*** (0.0026)	0.0561*** (0.0063)
	Observations	596,903	596,903	596,903	91,760
Average coefficients		**0.030**	**0.025**	**0.023**	**0.045**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is “small price change,” which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of baseline regression that includes only the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table C2. Category-level regressions of small price changes ($\Delta P \leq 10¢$) and sales volume, using all observations

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0288*** (0.0028)	0.0406*** (0.0028)	0.0362*** (0.0025)	0.0571*** (0.0045)
	Observations	467,137	467,137	467,137	158,600
Bath Soap	Coefficient (Std.)	0.0197*** (0.0071)	0.0479*** (0.0063)	0.0458*** (0.0061)	0.0701*** (0.0094)
	Observations	76,548	76,548	76,548	22,545
Bathroom Tissues	Coefficient (Std.)	0.0377*** (0.0055)	0.0246*** (0.0054)	0.0218*** (0.005)	0.0392*** (0.0074)
	Observations	347,559	347,559	347,559	88,388
Beer	Coefficient (Std.)	0.0184*** (0.0014)	0.0287*** (0.0014)	0.0244*** (0.0013)	0.0561*** (0.0038)
	Observations	617,181	617,181	617,181	95,440
Bottled Juice	Coefficient (Std.)	0.0591*** (0.0041)	0.0467*** (0.0031)	0.041*** (0.0032)	0.0553*** (0.0048)
	Observations	1,044,176	1,044,176	1,044,176	269,990
Canned Soup	Coefficient (Std.)	0.029*** (0.0038)	0.0194*** (0.0033)	0.0196*** (0.0031)	0.0339*** (0.004)
	Observations	1,041,402	1,041,402	1,041,402	309,450
Canned Tuna	Coefficient (Std.)	0.0418*** (0.0049)	0.0342*** (0.0044)	0.0294*** (0.004)	0.0461*** (0.0053)
	Observations	447,946	447,946	447,946	142,596
Cereals	Coefficient (Std.)	0.0249*** (0.0026)	0.0242*** (0.0024)	0.0228*** (0.0025)	0.0407*** (0.0035)
	Observations	771,993	771,993	771,993	281,908
Cheese	Coefficient (Std.)	0.0407*** (0.0027)	0.0278*** (0.0023)	0.0232*** (0.0023)	0.0282*** (0.0037)
	Observations	1,955,416	1,955,416	1,955,416	557,994
Cigarettes	Coefficient (Std.)	0.024* (0.0133)	0.0297*** (0.01)	0.0295*** (0.01)	0.0245** (0.0096)
	Observations	71,155	71,155	71,155	35,156
Cookies	Coefficient (Std.)	0.0466*** (0.0017)	0.0464*** (0.0017)	0.0404*** (0.0015)	0.0681*** (0.0029)
	Observations	1,581,102	1,581,102	1,581,102	297,881
Crackers	Coefficient (Std.)	0.0601*** (0.0035)	0.0543*** (0.0033)	0.0494*** (0.0031)	0.0709*** (0.0057)
	Observations	567,809	567,809	567,809	114,425
Dish Detergent	Coefficient (Std.)	0.0459*** (0.0041)	0.0411*** (0.0035)	0.0372*** (0.0034)	0.0618*** (0.0047)
	Observations	497,210	497,210	497,210	115,037
Fabric Softener	Coefficient (Std.)	0.0333*** (0.0041)	0.0292*** (0.0036)	0.0247*** (0.0037)	0.0529*** (0.0049)
	Observations	478,611	478,611	478,611	123,818
Front-End-Candies	Coefficient (Std.)	0.0184*** (0.0036)	0.0131*** (0.003)	0.0122*** (0.003)	0.0157*** (0.0034)
	Observations	537,812	537,812	537,812	173,538
Frozen Dinners	Coefficient (Std.)	0.0584*** (0.0041)	0.0528*** (0.0034)	0.051*** (0.0035)	0.1183*** (0.0065)
	Observations	567,884	567,884	567,884	86,750

Table C2. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0359*** (0.0019)	0.0392*** (0.0017)	0.0382*** (0.0017)	0.087*** (0.0038)
	Observations	2,084,913	2,084,913	2,084,913	419,173
Frozen Juices	Coefficient (Std.)	0.0389*** (0.0038)	0.0331*** (0.0035)	0.0297*** (0.0033)	0.0504*** (0.0054)
	Observations	703,893	703,893	703,893	162,718
Grooming Products	Coefficient (Std.)	0.0307*** (0.0021)	0.0473*** (0.002)	0.0423*** (0.0019)	0.0601*** (0.0042)
	Observations	1,092,785	1,092,785	1,092,785	210,384
Laundry Detergents	Coefficient (Std.)	0.0176*** (0.0032)	0.0191*** (0.0028)	0.0162*** (0.0024)	0.0367*** (0.0046)
	Observations	766,390	766,390	766,390	183,661
Oatmeal	Coefficient (Std.)	0.0333*** (0.0069)	0.023*** (0.0057)	0.0205*** (0.0056)	0.045*** (0.0115)
	Observations	181,193	181,193	181,193	69,150
Paper Towels	Coefficient (Std.)	0.0394*** (0.0111)	0.0327*** (0.0114)	0.0304*** (0.0114)	0.0482*** (0.0089)
	Observations	274,918	274,918	274,918	58,771
Refrigerated Juices	Coefficient (Std.)	0.0348*** (0.0032)	0.0283*** (0.0029)	0.025*** (0.0027)	0.047*** (0.0048)
	Observations	827,359	827,359	827,359	169,826
Shampoos	Coefficient (Std.)	0.0185*** (0.0013)	0.0361*** (0.0012)	0.0328*** (0.0012)	0.0503*** (0.0026)
	Observations	1,315,278	1,315,278	1,315,278	272,979
Snack Crackers	Coefficient (Std.)	0.0492*** (0.0035)	0.0483*** (0.0033)	0.0432*** (0.003)	0.084*** (0.0045)
	Observations	903,254	903,254	903,254	172,655
Soaps	Coefficient (Std.)	0.0321*** (0.0013)	0.0313*** (0.0011)	0.0266*** (0.0009)	0.0634*** (0.0027)
	Observations	4,985,172	4,985,172	4,985,172	451,007
Soft Drinks	Coefficient (Std.)	0.0519*** (0.0079)	0.0488*** (0.0044)	0.0398*** (0.0042)	0.0704*** (0.0059)
	Observations	395,114	395,114	395,114	110,144
Toothbrushes	Coefficient (Std.)	0.0197*** (0.0035)	0.0358*** (0.0034)	0.0305*** (0.0032)	0.0504*** (0.0056)
	Observations	481,842	481,842	481,842	93,164
Toothpastes	Coefficient (Std.)	0.0251*** (0.0029)	0.0349*** (0.0025)	0.0311*** (0.0025)	0.0684*** (0.0058)
	Observations	771,084	771,084	771,084	136,134
Average coefficients		**0.0350**	**0.0351**	**0.0316**	**0.0552**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix D. Using a rolling 52-week window to calculate the average sales volume

In the paper, we calculate the average sales volume for each product in each store over the entire period. This has the advantage of using a long-term "expected" sales volume for each product in each store. However, it implicitly assumes that the retailer can forecast future sales.

An alternative is to assume that the retailer makes decisions based on a recent past. To control for this possibility, we calculate the average sales volume for each product in each store based on data from the previous 52 weeks.

We then use the results to re-estimate regressions similar to the ones that we report in Table 3 in the paper. The regressions take the following form:

$$\begin{aligned} small\ price\ change_{i,s,t} &= \alpha + \beta \ln(average\ sales\ volume_{i,s}) + \gamma \mathbf{X}_{i,s,t} \\ &+ month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \end{aligned} \tag{D1}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the 52 weeks preceding week *t*. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product.

The results are summarized in Table D1. The values in the table are the coefficients of the log of the average sales volume. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 24 of the 29 coefficients of the log of the average sales volume are positive and that 16 of them are statistically significant. One more coefficient is marginally significant. None of the five negative coefficients are statistically significant. The average coefficient is 0.018, suggesting that a 1% increase in the sales volume is associated with a 1.8% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). We find that 25 of the 29 coefficients are positive and that 17 of them are statistically significant. None of the four negative coefficients are statistically significant. The average coefficient is 0.017, suggesting that a 1% increase in the sales volume is associated with a 1.7% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. Again, we find that 25 of the 29 coefficients are positive and that 16 of them are statistically significant. One more coefficient is marginally statistically significant. None of the negative coefficients is statistically significant. The average coefficient is 0.015, suggesting that a 1% increase in the sales volume is associated with a 1.5% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, the results are stronger. We find that 27 of the 29 coefficients are positive and 21 of them are statistically significant. One more coefficient is marginally significant. Out of the two negative coefficients, one (cereals) is marginally significant. The average coefficient is 0.31, suggesting that a 1% increase in the sales volume is associated with a 3.1% increase in the likelihood of a small price change.

Thus, basing the estimation on the sales volume of the more recent period does not change our main results. The correlation between small price changes and sales volume holds in a large majority of the product categories.

Table D1. Category-level regressions of small price changes $(\Delta P \leq 10¢)$, using a rolling 52-week window for sales volume

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0339*** (0.0084)	0.0262*** (0.0074)	0.0215*** (0.0071)	0.0358** (0.0139)
	Observations	258,282	258,282	258,282	71,945
Bath Soap	Coefficient (Std.)	0.0263*** (0.0076)	0.0246*** (0.0075)	0.0256*** (0.0072)	0.0421*** (0.015)
	Observations	31,704	31,704	31,704	5,186
Bathroom Tissues	Coefficient (Std.)	0.0155 (0.0134)	0.0084 (0.0111)	0.0051 (0.0101)	0.0225** (0.0104)
	Observations	311,206	311,206	311,206	76,063
Beer	Coefficient (Std.)	0.0172*** (0.0019)	0.0146*** (0.0016)	0.0111*** (0.0016)	0.0318*** (0.0062)
	Observations	410,854	410,854	410,854	50,131
Bottled Juice	Coefficient (Std.)	0.0225*** (0.007)	0.0122** (0.0057)	0.0102* (0.0059)	0.001 (0.0075)
	Observations	917,557	917,557	917,557	228,910
Canned Soup	Coefficient (Std.)	-0.0107 (0.0078)	-0.0038 (0.007)	-0.0015 (0.007)	0.0116 (0.0076)
	Observations	890,145	890,145	890,145	256,793
Canned Tuna	Coefficient (Std.)	0.001 (0.0112)	0.004 (0.0091)	0.0014 (0.0088)	0.0257*** (0.0075)
	Observations	354,012	354,012	354,012	110,295
Cereals	Coefficient (Std.)	0.0059 (0.006)	0.0062 (0.0049)	0.0046 (0.0048)	-0.0006 (0.0092)
	Observations	692,679	692,679	692,679	242,184
Cheese	Coefficient (Std.)	0.0109* (0.0065)	0.0034 (0.0052)	0.0014 (0.0052)	-0.0058 (0.0075)
	Observations	1,725,208	1,725,208	1,725,208	489,617
Cigarettes	Coefficient (Std.)	0.0081 (0.0158)	0.0078 (0.014)	0.0067 (0.0136)	0.0083 (0.0133)
	Observations	13,712	13,712	13,712	8,591
Cookies	Coefficient (Std.)	0.0335*** (0.0044)	0.0253*** (0.004)	0.0229*** (0.0039)	0.0392*** (0.0076)
	Observations	1,286,069	1,286,069	1,286,069	209,459
Crackers	Coefficient (Std.)	0.0493*** (0.0076)	0.0364*** (0.0072)	0.0339*** (0.0072)	0.0446*** (0.0087)
	Observations	448,590	448,590	448,590	81,601
Dish Detergent	Coefficient (Std.)	0.0292*** (0.0071)	0.0276*** (0.0059)	0.0232*** (0.0058)	0.0329*** (0.0087)
	Observations	374,776	374,776	374,776	89,534
Fabric Softener	Coefficient (Std.)	0.0126 (0.0091)	0.0197*** (0.007)	0.0152** (0.0067)	0.0312** (0.0134)
	Observations	357,352	357,352	357,352	96,359
Front-End-Candies	Coefficient (Std.)	-0.0161 (0.0098)	-0.0004 (0.0085)	-0.0006 (0.0084)	0.0032 (0.006)
	Observations	471,213	471,213	471,213	140,179
Frozen Dinners	Coefficient (Std.)	0.0587*** (0.0068)	0.0516*** (0.0054)	0.0519*** (0.0055)	0.0751*** (0.0101)
	Observations	443,557	443,557	443,557	58,225

Table D1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0186*** (0.0025)	0.0272*** (0.0026)	0.0288*** (0.0025)	0.0518*** (0.0058)
	Observations	1,771,958	1,771,958	1,771,958	318,555
Frozen Juices	Coefficient (Std.)	0.0203*** (0.0074)	0.0174*** (0.0065)	0.013** (0.0065)	0.0597*** (0.0086)
	Observations	627,846	627,846	627,846	140,924
Grooming Products	Coefficient (Std.)	0.0392*** (0.0035)	0.0364*** (0.0033)	0.0349*** (0.0033)	0.0493*** (0.0076)
	Observations	607,229	607,229	607,229	84,669
Laundry Detergents	Coefficient (Std.)	-0.0072 (0.0058)	0.0049 (0.0048)	0.0019 (0.0048)	0.0216*** (0.0094)
	Observations	557,386	557,386	557,386	133,678
Oatmeal	Coefficient (Std.)	-0.0021 (0.0111)	-0.0071 (0.0093)	-0.0075 (0.0089)	0.0081 (0.009)
	Observations	153,883	153,883	153,883	56,264
Paper Towels	Coefficient (Std.)	0.0293 (0.0236)	0.0285 (0.0193)	0.0264 (0.0187)	0.0382* (0.0196)
	Observations	229,649	229,649	229,649	48,847
Refrigerated Juices	Coefficient (Std.)	-0.0034 (0.0082)	-0.0012 (0.0067)	-0.0048 (0.0065)	0.0223*** (0.008)
	Observations	763,905	763,905	763,905	150,388
Shampoos	Coefficient (Std.)	0.029*** (0.0023)	0.0268*** (0.0022)	0.0231*** (0.0021)	0.0306*** (0.0059)
	Observations	605,146	605,146	605,146	60,380
Snack Crackers	Coefficient (Std.)	0.0367*** (0.006)	0.0306*** (0.0055)	0.0273*** (0.0053)	0.0563*** (0.0092)
	Observations	758,707	758,707	758,707	128,389
Soaps	Coefficient (Std.)	0.0139*** (0.0031)	0.0134*** (0.0029)	0.0117*** (0.0029)	0.046*** (0.0047)
	Observations	4,147,187	4,147,187	4,147,187	304,352
Soft Drinks	Coefficient (Std.)	0.0075 (0.0144)	0.0101 (0.0109)	0.0071 (0.0106)	0.035*** (0.0104)
	Observations	297,007	297,007	297,007	83,454
Toothbrushes	Coefficient (Std.)	0.0291*** (0.0065)	0.0275*** (0.0066)	0.023*** (0.0062)	0.0303** (0.0123)
	Observations	274,744	274,744	274,744	38,861
Toothpastes	Coefficient (Std.)	0.0175*** (0.0063)	0.0177*** (0.0054)	0.0147*** (0.0055)	0.0456*** (0.01)
	Observations	567,725	567,725	567,725	84,935
Average coefficients		**0.0181**	**0.0171**	**0.0149**	**0.0308**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the 52 weeks preceding time *t*. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix E. Adding Dominick's pricing zones

According to Dominick's data manual, Dominick's employed 16 price zones. Thus, we can use the zones as a proxy for the competition level.

We, therefore, incorporate the data on pricing zones and re-estimate regressions similar to the ones that we report in Table 3 in the paper. The regressions take the form,

$$\begin{aligned} small\ price\ change_{i,s,t} &= \alpha + \beta \ln(average\ sales\ volume_{i,s}) + \gamma \mathbf{X}_{i,s,t} \\ &+ month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \end{aligned} \quad \text{(E1)}$$

where *small price change* is a dummy that equals 1 if a price change of product i in store s at time t is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product i in store s over the 52 weeks preceding week t. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and u is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product.

The figures in Table E1 are the coefficients of the log of the average sales volume. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 27 of the 29 coefficients of the log of the average sales volume are positive. 15 of the 27 are statistically significant, and 4 more are marginally significant. The average coefficient is 0.014, suggesting that a 1% increase in the sales volume is associated with a 1.4% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices (which we identify using the sales filter algorithm of Fox and Syed 2016), and Dominick's pricing zone. We find that 27 of the 29 coefficients are positive. 14 of the positive coefficients are statistically significant, and one more is marginally significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

In column 3, we add a control for 9-ending prices. We find that 27 of the 29 coefficients are positive. 14 of the 29 are statistically significant, and two more are marginally significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, we find that 27 of the 29 coefficients are positive. 18 are statistically significant, and 5 more are marginally significant. The average coefficient is 0.020, suggesting that a 1% increase in the sales volume is associated with a 2.0% increase in the likelihood of a small price change.

Thus, adding a control for pricing zones does not change our main results. The correlation between small price changes and sales volume holds in all 29 product categories.

Table E1. Category-level regressions of small price changes and sales volume, controlling for Dominick's pricing zones

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0169*** (0.004)	0.0128*** (0.0038)	0.0126*** (0.0038)	0.0133*** (0.0079)
	Observations	74,451	74,451	74,451	24,729
Bath Soap	Coefficient (Std.)	0.0099 (0.0128)	0.0059 (0.013)	0.0058 (0.0126)	-0.0267 (0.0256)
	Observations	6,650	6,650	6,650	1,466
Bathroom Tissues	Coefficient (Std.)	0.0479*** (0.0087)	0.0203** (0.0084)	0.02** (0.0083)	0.0349*** (0.0098)
	Observations	56,458	56,458	56,458	19,285
Beer	Coefficient (Std.)	0.002*** (0.0006)	0.0043*** (0.0007)	0.0043*** (0.0007)	0.018*** (0.0055)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.0235*** (0.0079)	0.0187*** (0.007)	0.0188*** (0.007)	0.0333*** (0.0091)
	Observations	224,857	224,857	224,857	60,015
Canned Soup	Coefficient (Std.)	-0.0023 (0.0091)	-0.004 (0.0088)	-0.0012 (0.0086)	0.0129* (0.0072)
	Observations	233,779	233,779	233,779	95,310
Canned Tuna	Coefficient (Std.)	0.0092 (0.0065)	-0.0006 (0.0057)	-0.0008 (0.0057)	0.0128 (0.0083)
	Observations	112,629	112,629	112,629	31,922
Cereals	Coefficient (Std.)	0.0051 (0.0065)	0.0049 (0.0063)	0.005 (0.0063)	0.0221*** (0.0071)
	Observations	141,087	141,087	141,087	72,789
Cheese	Coefficient (Std.)	0.0069* (0.0038)	0.0066** (0.0033)	0.0063* (0.0033)	0.0124*** (0.0046)
	Observations	357,679	357,679	357,679	92,758
Cigarettes	Coefficient (Std.)	0.0044 (0.0051)	0.0021 (0.0049)	0.0022 (0.0048)	0 (0.0055)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0084*** (0.0019)	0.0074*** (0.002)	0.0073*** (0.0019)	0.0063* (0.0036)
	Observations	317,932	317,932	317,932	66,087
Crackers	Coefficient (Std.)	0.0009 (0.0033)	0.0007 (0.0032)	0.001 (0.0032)	0.0114* (0.0066)
	Observations	115,658	115,658	115,658	24,771
Dish Detergent	Coefficient (Std.)	0.0295*** (0.0068)	0.0241*** (0.006)	0.0244*** (0.0058)	0.0261*** (0.0058)
	Observations	85,222	85,222	85,222	26,735
Fabric Softener	Coefficient (Std.)	0.0147** (0.0069)	0.0028 (0.0057)	0.0033 (0.0057)	0.0233*** (0.0078)
	Observations	85,337	85,337	85,337	27,488
Front-End-Candies	Coefficient (Std.)	-0.004 (0.0043)	-0.0044 (0.0034)	-0.0043 (0.0034)	-0.0005 (0.0032)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.049*** (0.007)	0.0414*** (0.0062)	0.0431*** (0.0062)	0.0751*** (0.0104)
	Observations	52,893	52,893	52,893	12,287

Table E1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0192*** (0.0027)	0.0186*** (0.0025)	0.0188*** (0.0025)	0.0247*** (0.0039)
	Observations	345,223	345,223	345,223	117,044
Frozen Juices	Coefficient (Std.)	0.0134* (0.0073)	0.0113* (0.0068)	0.0124* (0.0066)	0.0213** (0.0087)
	Observations	118,582	118,582	118,582	40,517
Grooming Products	Coefficient (Std.)	0.0097*** (0.0033)	0.0111*** (0.0033)	0.0113*** (0.0033)	0.0166 (0.011)
	Observations	101,944	101,944	101,944	22,102
Laundry Detergents	Coefficient (Std.)	0.0213*** (0.0047)	0.0128*** (0.0039)	0.0131*** (0.0039)	0.0175*** (0.0057)
	Observations	121,566	121,566	121,566	42,121
Oatmeal	Coefficient (Std.)	0.0154 (0.0124)	0.0086 (0.0121)	0.0067 (0.0115)	0.059*** (0.0115)
	Observations	25,523	25,523	25,523	13,605
Paper Towels	Coefficient (Std.)	0.0275*** (0.0156)	0.021 (0.0178)	0.0225 (0.0177)	0.0325** (0.016)
	Observations	48,199	48,199	48,199	9,243
Refrigerated Juices	Coefficient (Std.)	0.0136* (0.0077)	0.0062 (0.0079)	0.0063 (0.0077)	0.0253** (0.0121)
	Observations	108,965	108,965	108,965	23,705
Shampoos	Coefficient (Std.)	0.0098*** (0.0025)	0.0104*** (0.0025)	0.0104*** (0.0025)	0.0232*** (0.008)
	Observations	88,193	88,193	88,193	16,099
Snack Crackers	Coefficient (Std.)	0.0013 (0.0029)	0.0033 (0.0028)	0.0033 (0.0028)	0.0153*** (0.0052)
	Observations	176,527	176,527	176,527	38,123
Soaps	Coefficient (Std.)	0.0237*** (0.0088)	0.013 (0.0082)	0.0165** (0.0081)	0.0509*** (0.0117)
	Observations	56,725	56,725	56,725	16,882
Soft Drinks	Coefficient (Std.)	0.0087*** (0.0022)	0.013*** (0.0018)	0.0121*** (0.0018)	0.0078** (0.0034)
	Observations	243,837	243,837	243,837	49,989
Toothbrushes	Coefficient (Std.)	0.013*** (0.0046)	0.0098** (0.0047)	0.0091** (0.0046)	0.019* (0.0102)
	Observations	52,185	52,185	52,185	13,695
Toothpastes	Coefficient (Std.)	0.0007 (0.0039)	0.0001 (0.0038)	0.0003 (0.0038)	0.0052 (0.0082)
	Observations	100,845	100,845	100,845	28,039
Average coefficients		**0.0138**	**0.0097**	**0.0100**	**0.0204**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product i in store s over the 52 weeks preceding time t . Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices, which we identify using a sales filter algorithm, and the pricing zone of the store. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$.

Appendix F. Robustness of the Product-level regressions of the % of small price changes and sales volume

In the paper, we study the correlation between small price changes and sales volume at the product level using regressions that have only the sales volume as the independent variable. This can raise concerns that the results may be driven by differences between the stores rather than by differences in the sales volume.

To mitigate this concern, we augment the data with demographic information about consumers living in the neighborhood of each store, including their median income, the share of minorities, and the share of unemployed. To control for local competition, we also add a control for the pricing zone of each store, using pricing zone indicators included in Dominick's data.

We estimate for each product in each category an OLS regression with robust standard errors. The dependent variable is the share of small price changes for the product in each store. The independent variable is the average sales volume of the product in each store, the median income, the share of minorities, the share of unemployed, and the stores' pricing zone.

As we do in the paper, we use observations on price changes only if we observe the price in both weeks t and $t + 1$ and the post change price remained unchanged for at least 2 weeks. The estimation results are summarized in Table F1. Column 1 presents for each product category, the average of the estimated coefficients. Column 2 presents the total number of coefficients. Column 3 presents the percentage of the positive coefficients. Column 4 presents the number of statistically significant coefficients. Column 5 presents the percentage of positive and statistically significant coefficients out of the total number of statistically significant coefficients.

According to the figures in the table, the average coefficients are positive in 28 of the 29 product categories. The only exception is in the highly regulated cigarettes category. Further, in all categories, the number of positive coefficients far exceeds the number of negative coefficients. On average, 72.19% of all the coefficients are positive.

Focusing on statistically significant coefficients, we find a far greater number of positive coefficients that are significant than negative coefficients that are significant. On average, 87.71% of all the statistically significant coefficients are positive. In other words, for the overwhelming majority of the individual products in our sample, we find a positive relationship between sales volume and the share of small price changes.

As another test, we estimate linear probability model (LPM) regressions with robust standard errors, instead of regressions at the store level. In other words, we estimate:

$$small\ price\ change_{i,s,t} = \alpha + \beta ln\left(average\ sales\ volume_{i,s}\right) + \gamma X_{i,s,t} + u_{i,s,t} \qquad \text{(F1)}$$

where small price change is a dummy that equals 1 if a price change of product *i* in store *s* in week *t* is less or equal to 10¢, and 0 otherwise. The average sales volume is the average sales volume of product *i* in store *s* over the sample period.[1] **X** is a matrix of other control variables.

We estimate a separate regression for each product in each category, conditional on it having at least 30 price changes and at least 1 small price change over the sample period.[2] Table F2 reports the estimation results of regressions in which the **X** matrix is empty. We find that in all but the toothpaste category, the average coefficient is positive. Furthermore, on average, 72.19% of the coefficients are positive. When we focus on the positive and statistically significant coefficients, we find that, on average, 91.96% of the coefficients are positive.

Table F3 reports the estimation results of regressions in which the **X** matrix includes the following independent variables: the log of the average price, the log of the absolute change in the wholesale price, a dummy for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016), and a dummy for 9-ending prices.

We find that 22 of the 28 average coefficients are positive. When we focus on all the coefficients, we find that on average, 67.61% of the coefficients in a category are positive. When we focus on positive and statistically significant coefficients, we find that,

[1] In calculating the average sales volume, we need to account for missing observations, because a missing observation in week *t* implies that the product was either out of stock or had 0 sales on that week. Thus, averaging over the available observations can lead to an upward bias for products that are sold in small numbers. Therefore, for each product in each store, we calculate the average by first determining the total number of units sold over all available observations. We then identify the first and last week for which we have observations, and calculate the average for each product-store as $\frac{total\ no.\ of\ units\ sold}{last\ week - first\ week}$. The resulting figure is smaller than we would obtain if we averaged over all available observations (which would not include observations on weeks with 0 sales).

[2] Prices and price changes in the cigarettes category were heavily regulated during the sample period. Consequently, we have no product-store combination for which we have 30 or more price changes over the sample period in the cigarettes' category.

on average, 89.57% of the coefficients are positive.

We therefore conclude that changing the estimation method does not change the conclusions we report in the paper. There is a positive correlation at the product level between the likelihood of a small price change and the sales volume.

Table F1. Product-level regressions of the % of small price changes and sales volume by categories, including controls

Product Category	Average coefficient (1)	No. of coefficients (2)	% positive coefficients (3)	No. of significant coefficients (4)	% positive and significant coefficients (5)
Analgesics	0.025	212	74.53%	48	97.92%
Bath Soaps	0.036	33	72.73%	8	100.00%
Bathroom tissues	0.045	100	75.00%	37	89.19%
Beers	0.018	202	89.11%	71	98.59%
Bottled juices	0.042	370	73.24%	115	86.96%
Canned soups	0.032	348	70.98%	112	86.61%
Canned tuna	0.025	181	59.67%	61	70.49%
Cereals	0.039	345	68.41%	110	81.82%
Cheese	0.033	474	70.68%	151	92.72%
Cigarettes	-0.016	106	50.94%	9	0.00%
Cookies	0.034	666	74.77%	213	94.37%
Crackers	0.040	212	79.72%	72	98.61%
Dish detergents	0.032	199	69.85%	46	91.30%
Fabric softeners	0.029	226	70.80%	52	94.23%
Front end candies	0.033	274	63.50%	56	91.07%
Frozen dinners	0.056	215	84.19%	77	96.10%
Frozen entrees	0.044	671	82.41%	270	97.78%
Frozen juices	0.045	142	79.58%	57	96.49%
Grooming products	0.008	528	68.75%	89	94.38%
Laundry detergents	0.011	406	63.30%	74	77.03%
Oatmeal	0.042	69	71.01%	13	92.31%
Paper towels	0.045	90	73.33%	37	81.08%
Refrigerated juices	0.031	176	68.75%	63	82.54%
Shampoos	0.019	608	70.39%	97	97.94%
Snack crackers	0.043	282	77.66%	89	95.51%
Soaps	0.032	216	68.52%	43	81.40%
Soft drinks	0.030	897	76.25%	285	96.84%
Toothbrushes	0.024	202	80.20%	45	93.33%
Toothpastes	0.013	336	65.18%	61	86.89%
Average	0.031	303	72.19%	85	87.71%

Notes: Results of product-level regression. The dependent variable in all regressions is the % of small price changes at each store. For each product category, column 1 presents the average estimated coefficients of the average sales volumes. The regressions also include controls for the median income, the share of ethnic minorities, the unemployment rate, and the pricing zone of the store. Column 2 presents the total number of coefficients. Column 3 presents the % of positive coefficients out of all coefficients. Column 4 presents the total number of coefficients that are statistically significant at the 5% level. Column 5 presents the % of coefficients that are positive and statistically significant, at the 5% level.

Table F2. Product-level regressions of the % of small price changes and sales volume by categories, using LPM

Product Category	Average coefficient (1)	No. of coefficients (2)	% positive coefficients (3)	No. of significant coefficients (4)	% positive and significant coefficients (5)
Analgesics	0.055	24	70.83%	2	100.00%
Bath Soaps	0.290	1	100.00%	0	–
Bathroom tissues	0.032	23	86.96%	15	86.67%
Beers	0.007	68	72.06%	17	100.00%
Bottled juices	0.044	98	76.53%	43	90.70%
Canned soups	0.049	100	81.00%	40	87.50%
Canned tuna	0.012	37	56.76%	14	42.86%
Cereals	0.060	59	76.27%	28	92.86%
Cheese	0.027	161	83.23%	64	95.31%
Cigarettes	–	0	–	0	–
Cookies	0.047	109	79.82%	34	100.00%
Crackers	0.236	51	88.24%	24	100.00%
Dish detergents	0.024	30	70.00%	15	93.33%
Fabric softeners	0.037	21	80.95%	9	100.00%
Front end candies	0.121	41	95.12%	29	100.00%
Frozen dinners	0.347	32	93.75%	14	100.00%
Frozen entrees	0.040	177	87.57%	97	97.94%
Frozen juices	0.039	66	89.39%	37	91.89%
Grooming products	0.009	30	53.33%	1	100.00%
Laundry detergents	0.016	18	61.11%	2	100.00%
Oatmeal	0.298	15	80.00%	0	–
Paper towels	0.012	21	66.67%	10	60.00%
Refrigerated juices	0.007	57	56.14%	29	68.97%
Shampoos	0.075	11	54.55%	0	–
Snack crackers	0.036	76	88.16%	37	100.00%
Soaps	0.027	17	64.71%	0	–
Soft drinks	0.031	285	72.63%	103	99.03%
Toothbrushes	0.034	22	63.64%	1	100.00%
Toothpastes	-0.245	51	72.55%	10	100.00%
Average	**0.063**	**59**	**75.78%**	**23**	**91.96%**

Notes: The table reports the estimation results of product-level LPM regressions. The dependent variable in all regressions is a dummy for price small price changes ($\Delta p < 10¢$). The main independent variable is the log of the sales volume. For each product category, column 1 presents the average estimated coefficients of the average sales volumes. Column 2 presents the total number of coefficients. Column 3 presents the % of positive coefficients out of all coefficients. Column 4 presents the total number of coefficients that are statistically significant at the 5% level. Column 5 presents the % of coefficients that are positive and statistically significant, at the 5% level.

Table F3. Product-level regressions of the % of small price changes and sales volume by categories, using LPM with extra controls

Product Category	Average coefficient (1)	No. of coefficients (2)	% positive coefficients (3)	No. of significant coefficients (4)	% positive and significant coefficients (5)
Analgesics	0.078	24	62.50%	1	100.00%
Bath Soaps	-0.044	1	0.00%	0	–
Bathroom tissues	-0.010	23	69.57%	5	80.00%
Beers	-0.001	69	57.97%	8	100.00%
Bottled juices	0.019	98	71.43%	14	92.86%
Canned soups	0.025	100	84.00%	13	100.00%
Canned tuna	0.004	37	64.86%	5	40.00%
Cereals	0.052	59	77.97%	18	100.00%
Cheese	0.008	161	73.91%	38	92.11%
Cigarettes	–	0	–	0	–
Cookies	-0.060	109	79.82%	25	100.00%
Crackers	0.071	50	88.00%	20	100.00%
Dish detergents	0.025	30	83.33%	9	100.00%
Fabric softeners	0.090	21	100.00%	9	100.00%
Front end candies	0.015	41	63.41%	9	100.00%
Frozen dinners	0.205	32	78.13%	6	100.00%
Frozen entrees	0.023	177	80.23%	43	93.02%
Frozen juices	0.023	66	74.24%	22	90.91%
Grooming products	-0.016	30	46.67%	1	100.00%
Laundry detergents	0.009	18	61.11%	2	100.00%
Oatmeal	0.363	15	66.67%	0	–
Paper towels	-0.015	21	33.33%	6	16.67%
Refrigerated juices	0.004	57	66.67%	27	70.37%
Shampoos	0.074	11	63.64%	0	–
Snack crackers	0.044	76	85.53%	33	100.00%
Soaps	0.065	17	64.71%	3	66.67%
Soft drinks	0.185	286	66.78%	60	96.67%
Toothbrushes	0.012	22	54.55%	1	100.00%
Toothpastes	0.053	50	74.00%	13	100.00%
Average	**0.046**	**59**	**67.61%**	**13**	**89.57%**

Notes: The table reports the estimation results of product-level LPM regressions. The dependent variable in all regressions is a dummy for price small price changes ($\Delta p < 10¢$). The main independent variable is the log of the sales volume. The regression also includes the following independent variables: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices, which we identify using a sales filter algorithm, and a dummy for 9-ending prices as an additional control. For each product category, column 1 presents the average estimated coefficients of the average sales volumes. Column 2 presents the total number of coefficients. Column 3 presents the % of positive coefficients out of all coefficients. Column 4 presents the total number of coefficients that are statistically significant at the 5% level. Column 5 presents the % of coefficients that are positive and statistically significant, at the 5% level.

Appendix G. Robustness: sales volume, revenue, and small price changes

In the paper, we estimate category-level regressions of small price changes where the main independent variables are sales volume and revenue. In this appendix, we conduct two sets of robustness tests. First, we add further controls and estimate the category-level regressions again. Second, because the correlation between sales volume and revenue at the category level is high, the results of category-level regressions could be suspect. We, therefore, pool the data from all categories together and re-estimate the regressions using the pooled data.

In Tables G1 and G2, we present the results of the category-level regression estimations. The regressions we estimate are of the following form:

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(average\ sales\ volume_{i,s}\right) + \qquad \text{(G1)}$$

$$\beta_2 ln\left(average\ revenue_{i,s}\right) + \gamma \boldsymbol{X}_{i,s,t} + month_t + year_t + \delta_s + \mu_i + u_{i,s,t}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. The *average revenue* is the average revenue of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product. As we do in the paper, we use observations on price changes only if we observe the price in both week *t* and *t*+1 and the post change price remained unchanged for at least 2 weeks.

The coefficient columns in the sales volume and the revenue panels of Table G1 give the coefficients of sales volume and revenue, respectively in a regression that also includes percentage changes in the wholesale price and a dummy for sale- and bounce-back prices as control variables.[3] This does not change the results we report in the paper. 22 of the sales volume coefficients are positive. 14 of the coefficients are statistically

[3] We do not add the log of the average price because the log of the price plus the log of the sales volume equals the log of the revenue, leading to a perfect multicollinearity.

significant. 4 of the negative coefficients are statistically significant. Of the revenue coefficients, 21 are negative, and all of them are statistically significant.

The coefficient columns in the sales volume and the revenue panels of Table G2, present the coefficients of sales volume and revenue, respectively in a regression in which we also include a dummy for 9-ending prices. We find that 22 of the sales volume coefficients are statistically significant. Of the 22 positive coefficients, 14 are statistically significant. Of the revenue coefficients, 18 of the coefficients are negative, all of which are statistically significant.

Thus, including more controls does not change the conclusions we derive in the paper. The revenue seems to be correlated to small price changes mostly through the sales volume. The effect of the price, holding sales volume constant seems to be mostly negative.

However, the results at the category level are suspect because of the strong correlation between sales volume and revenue. In the paper, we show that the average correlation at the category level is 0.85. The high correlation at the category level is due to the relatively low within-category variation in prices. To attenuate this concern, we pool the data from all categories together. Since the between-categories variation in prices is higher than the within-category variation, we find that in the pooled data, the correlation between sales volume and revenue is 0.70.

Table G3 presents the results of regressions similar to G1, to which we also add fixed effects for the categories. Column 1 gives the results of a regression that includes only the sales volume and the revenue as independent variables. The coefficient of the sales volume, 0.42, is positive and statistically significant, whereas the coefficient of the revenue, −0.40, is negative and statistically significant.

In column 2, we add controls for percentage changes in the wholesale price, and for sale- and bounce-back prices. The coefficient of the sales volume, 0.38, is positive and statistically significant, whereas the coefficient of the revenue, −0.36, is negative and statistically significant.

In column 3, we also add a dummy for 9-ending prices. The coefficient of the sales volume, 0.02, remains positive and statistically significant, whereas the coefficient of the revenue, −0.61, remains negative and statistically significant.

Finally, in column 4, we remove sale prices and focus on regular prices. The coefficient of sales volume, 0.03, is positive and significant. The coefficient of revenue, −0.53, is negative and statistically significant.

Thus, also when we estimate the regressions using the pooled data, we find a positive correlation between sales volume and small price changes. We also find that when we hold the sales volume constant, the correlation between revenue and small price changes is negative.

As an alternative test of the role of revenue, we redefine the average revenue as the product of the average sales volume and the average price. Both are defined the same way as in the paper. We then estimate

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(\widehat{average\ revenue}_{i,s}\right) + \gamma \boldsymbol{X}_{i,s,t} + month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \qquad \text{(G2)}$$

where $average\ revenue_{i,s}$ is the product of the average sales volume and the average price of product i offered at store s, and the other variables are defined as above. As above, we estimate a series of category-level regressions.

Table G4 gives the estimation results. In column 1, the only control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 28 of the 29 coefficients of the log of the average revenue are positive. All the positive coefficients are statistically significant. The average coefficient is 0.017, suggesting that a 1% increase in the average revenue is associated with a 1.7% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices (which we identify using the sales filter algorithm of Fox and Syed 2016). We find that all 29 coefficients are positive. 28 of the positive coefficients are statistically significant, and one more is marginally significant. The average coefficient is 0.015, suggesting that a 1% increase in the average revenue is associated with a 1.5% increase in the likelihood of a small price change.

In column 3, we add a control for 9-ending prices. We find that all 29 coefficients are positive. 28 of the positive coefficients are statistically significant, and one more is marginally significant. The average coefficient is 0.015, suggesting that a 1% increase in the average revenue is associated with a 1.5% increase in the likelihood of a small price change.

As a further control for the effects of sales on the estimation results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, we find that all 29 coefficients are positive and statistically significant. The average coefficient is 0.029, suggesting that a 1% increase in the average revenue is associated with a 2.9% increase in the likelihood of a small price change.

Thus, the finding of the positive correlation between revenue and the likelihood of small price changes is robust. However, our previous results suggest that this correlation holds because of the sales volume component rather than the price component of the revenue. Indeed, we also include the average price as a control variable in this regression. If the correlation between the likelihood of a small price change and revenue were to work mainly through the price component of the revenue, then we would expect that the coefficient of the average price in columns 2–4 would be positive and statistically significant, while the average revenue coefficient would be close to 0 and statistically insignificant.

Table G1. Regressions with sales volume and revenue, with extra controls

Category	Sales Volume		Revenue		No. of Observations
	Coefficient	Std.	Coefficient	Std.	
Analgesics	0.2405***	0.0464	-0.223***	0.0467	144,461
Bath Soap	-0.3004**	0.1098	0.3289***	0.1099	15,295
Bathroom Tissues	0.4332***	0.1270	-0.4187***	0.1258	149,441
Beer	-0.0613**	0.0258	0.0764***	0.0257	290,620
Bottled Juice	0.69***	0.0983	-0.6651***	0.0982	496,557
Canned Soup	0.1141	0.0688	-0.1027	0.0690	495,543
Canned Tuna	0.4883***	0.1066	-0.4736***	0.1071	213,043
Cereals	0.1056**	0.0400	-0.0901**	0.0406	357,120
Cheese	0.3698***	0.1062	-0.3583***	0.1067	796,150
Cigarettes	-0.3952***	0.0589	0.405***	0.0588	36,157
Cookies	-0.0207	0.0222	0.0431*	0.0224	688,761
Crackers	0.1497***	0.0523	-0.1203***	0.0527	245,185
Dish Detergent	0.4543***	0.1332	-0.4291***	0.1329	189,633
Fabric Softener	0.8047***	0.1924	-0.7907***	0.1932	181,056
Front-End-Candies	0.3188***	0.0481	-0.3113***	0.0490	278,853
Frozen Dinners	0.0474	0.0460	-0.0106	0.0456	203,191
Frozen Entrees	-0.0026	0.0174	0.0278	0.0170	864,832
Frozen Juices	0.0946	0.0527	-0.075	0.0534	308,817
Grooming Products	0.0361	0.0335	-0.0155	0.0341	269,873
Laundry Detergents	0.251***	0.0537	-0.2413***	0.0532	272,765
Oatmeal	-0.0251	0.0212	0.0415*	0.0230	79,983
Paper Towels	0.711***	0.1851	-0.6752***	0.1856	116,204
Refrigerated Juices	0.0277	0.0606	-0.0063	0.0616	306,865
Shampoos	0.0178	0.0159	0.0017	0.0158	261,778
Snack Crackers	0.0477	0.0817	-0.0198	0.0826	398,665
Soap	0.4612***	0.1564	-0.4379***	0.1567	152,379
Soft Drinks	0.4933***	0.0442	-0.4694***	0.0435	1,350,618
Toothbrushes	0.0416	0.0401	-0.0215	0.0401	125,380
Toothpastes	-0.0764**	0.0344	0.0894***	0.0345	264,317
Average	**0.1902**	**0.0717**	**-0.1704**	**7190.0**	**329,432**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of the average sales volume of product *i* in store *s* over the sample period and the log of the average revenue of product *i* in store *s* over the sample period. The regressions also include the following independent variables: percentage changes in the wholesale price and a dummy for sale and bounce-back prices, as well as fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table G2. Regressions with sales volume and revenue, with extra controls, including a control for 9-ending prices

Category	Sales Volume		Revenue		No. of Observations
	Coefficient	Std.	Coefficient	Std.	
Analgesics	0.2366***	0.0456	-0.2193***	0.0459	144,461
Bath Soap	-0.3045***	0.1103	0.3337***	0.1103	15,295
Bathroom Tissues	0.4045***	0.1253	-0.3894***	0.1241	149,441
Beer	-0.0609**	0.0257	0.0759***	0.0256	290,620
Bottled Juice	0.682***	0.0931	-0.6576***	0.0930	496,557
Canned Soup	0.0983	0.0699	-0.0842	0.0701	495,543
Canned Tuna	0.482***	0.1057	-0.4676***	0.1062	213,043
Cereals	0.104***	0.0400	-0.0885**	0.0406	357,120
Cheese	0.3678***	0.1061	-0.3564***	0.1066	796,150
Cigarettes	-0.3872***	0.0587	0.397***	0.0586	36,157
Cookies	-0.0189	0.0218	0.0416*	0.0220	688,761
Crackers	0.1437***	0.0520	-0.1139**	0.0524	245,185
Dish Detergent	0.4572***	0.1321	-0.4321***	0.1318	189,633
Fabric Softener	0.8009***	0.1920	-0.7866***	0.1929	181,056
Front-End-Candies	0.3019***	0.0483	-0.2942***	0.0491	278,853
Frozen Dinners	0.0337	0.0450	0.0061	0.0444	203,191
Frozen Entrees	-0.0045	0.0175	0.0305*	0.0171	864,832
Frozen Juices	0.0847	0.0533	-0.0644	0.0539	308,817
Grooming Products	0.0299	0.0333	-0.0091	0.0339	269,873
Laundry Detergents	0.25***	0.0534	-0.2398***	0.0530	272,765
Oatmeal	-0.0234	0.0207	0.04*	0.0226	79,983
Paper Towels	0.7135***	0.1868	-0.6772***	0.1873	116,204
Refrigerated Juices	0.0209	0.0595	0.0003	0.0604	306,865
Shampoos	0.0152	0.0159	0.0043	0.0159	261,778
Snack Crackers	0.0423	0.0820	-0.0142	0.0829	398,665
Soap	0.4744***	0.1522	-0.4501***	0.1527	152,379
Soft Drinks	0.4319***	0.0332	-0.409***	0.0327	1,350,618
Toothbrushes	0.0002	0.0398	0.0197	0.0398	125,380
Toothpastes	-0.0752**	0.0344	0.0882**	0.0345	264,317
Average	**0.1828**	**0.0708**	**-0.1626**	**0.0710**	**329,432**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of the average sales volume of product *i* in store *s* over the sample period and the log of the average revenue of product *i* in store *s* over the sample period. The regressions also include the following independent variables: percentage changes in the wholesale price, a dummy for sale and bounce-back prices, and a dummy for 9-ending prices, as well as fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table G3. Regressions with sales volume and revenue, using a pooled dataset

	(1)	(2)	(3)	(4)
Log of sales	0.42***	0.38***	0.02***	0.03***
volume	(0.024)	(0.025)	(0.001)	(0.001)
Log of	−0.40***	−0.36***	−0.61***	−0.53***
revenue	(0.024)	(0.025)	(0.016)	(0.029)
Observations	9,553,542	9,553,542	9,553,542	2,328,405

Notes: The table reports the results of pooled fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of the average sales volume and the log of the revenue of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume, the log of the average revenue, and the fixed effects for months, years, categories, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices (which we identify using a sales filter algorithm) and the competition zone of the store. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table G4. Regression with the average revenue constructed as the average sales volume times the average price

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0147*** (0.0023)	0.0114*** (0.0021)	0.0113*** (0.0021)	0.0193*** (0.0045)
	Observations	144,461	144,461	144,461	44,950
Bath Soap	Coefficient (Std.)	0.018*** (0.0049)	0.017*** (0.0047)	0.0174*** (0.0046)	0.0579*** (0.0119)
	Observations	15,295	15,295	15,295	3,208
Bathroom Tissues	Coefficient (Std.)	0.0256*** (0.0057)	0.0134** (0.0056)	0.0137*** (0.0056)	0.0334*** (0.0082)
	Observations	149,441	149,441	149,441	47,041
Beer	Coefficient (Std.)	0.0085*** (0.0009)	0.0114*** (0.0008)	0.0114*** (0.0008)	0.047*** (0.0045)
	Observations	290,620	290,620	290,620	27,348
Bottled Juice	Coefficient (Std.)	0.0207*** (0.0049)	0.0172*** (0.0041)	0.017*** (0.0042)	0.0239*** (0.0061)
	Observations	496,557	496,557	496,557	133,714
Canned Soup	Coefficient (Std.)	0.0117** (0.0048)	0.01** (0.0044)	0.0121*** (0.0043)	0.0132*** (0.0045)
	Observations	495,543	495,543	495,543	176,235
Canned Tuna	Coefficient (Std.)	0.0153*** (0.0042)	0.0126*** (0.0039)	0.0124*** (0.0038)	0.0197*** (0.0048)
	Observations	213,043	213,043	213,043	64,161
Cereals	Coefficient (Std.)	0.0162*** (0.0032)	0.0134*** (0.003)	0.0133*** (0.003)	0.0158*** (0.0039)
	Observations	357,120	357,120	357,120	155,367
Cheese	Coefficient (Std.)	0.0148*** (0.0025)	0.0084*** (0.0023)	0.0084*** (0.0023)	0.0109*** (0.003)
	Observations	796,150	796,150	796,150	224,889
Cigarettes	Coefficient (Std.)	0.0092** (0.0028)	0.0095** (0.0028)	0.0095** (0.0028)	0.0084** (0.0034)
	Observations	36,157	36,157	36,157	30,262
Cookies	Coefficient (Std.)	0.0208*** (0.0015)	0.0178*** (0.0014)	0.018*** (0.0014)	0.0368*** (0.0029)
	Observations	688,761	688,761	688,761	132,488
Crackers	Coefficient (Std.)	0.0291*** (0.0025)	0.0229*** (0.0022)	0.0232*** (0.0022)	0.0366*** (0.0055)
	Observations	245,185	245,185	245,185	50,029
Dish Detergent	Coefficient (Std.)	0.029*** (0.0036)	0.0213*** (0.0032)	0.0212*** (0.0031)	0.0277*** (0.0037)
	Observations	189,633	189,633	189,633	53,289
Fabric Softener	Coefficient (Std.)	0.0124*** (0.0037)	0.0088*** (0.0034)	0.0089*** (0.0034)	0.0258*** (0.0044)
	Observations	181,056	181,056	181,056	56,234
Front-End-Candies	Coefficient (Std.)	-0.0016 (0.0033)	0.0045* (0.0026)	0.0048*** (0.0026)	0.0088*** (0.0026)
	Observations	278,853	278,853	278,853	111,635
Frozen Dinners	Coefficient (Std.)	0.0344*** (0.0028)	0.0288*** (0.0023)	0.0308*** (0.0023)	0.0597*** (0.0053)
	Observations	203,191	203,191	203,191	37,527

Table G4. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0187*** (0.0016)	0.0187*** (0.0015)	0.0193*** (0.0015)	0.0361*** (0.0026)
	Observations	864,832	864,832	864,832	213,545
Frozen Juices	Coefficient (Std.)	0.0203*** (0.0041)	0.0156*** (0.0037)	0.0162*** (0.0035)	0.0269*** (0.0055)
	Observations	308,817	308,817	308,817	87,919
Grooming Products	Coefficient (Std.)	0.0105*** (0.0015)	0.0134*** (0.0016)	0.0135*** (0.0016)	0.026*** (0.0046)
	Observations	269,873	269,873	269,873	51,819
Laundry Detergents	Coefficient (Std.)	0.0125*** (0.0024)	0.008*** (0.0023)	0.0082*** (0.0023)	0.0173*** (0.0037)
	Observations	272,765	272,765	272,765	85,184
Oatmeal	Coefficient (Std.)	0.0238*** (0.0066)	0.0127** (0.0058)	0.0129*** (0.0058)	0.0284*** (0.0082)
	Observations	79,983	79,983	79,983	36,043
Paper Towels	Coefficient (Std.)	0.025** (0.0081)	0.0251*** (0.0082)	0.0254*** (0.0083)	0.0353*** (0.0081)
	Observations	116,204	116,204	116,204	29,280
Refrigerated Juices	Coefficient (Std.)	0.0277*** (0.0041)	0.0179*** (0.0033)	0.0177*** (0.0033)	0.0272*** (0.0052)
	Observations	306,865	306,865	306,865	72,031
Shampoos	Coefficient (Std.)	0.0091*** (0.001)	0.0119*** (0.001)	0.0119*** (0.001)	0.0267*** (0.0031)
	Observations	261,778	261,778	261,778	40,996
Snack Crackers	Coefficient (Std.)	0.0267*** (0.0028)	0.0234*** (0.0026)	0.0236*** (0.0026)	0.0434*** (0.0045)
	Observations	398,665	398,665	398,665	78,581
Soaps	Coefficient (Std.)	0.0234*** (0.0041)	0.0155*** (0.0037)	0.0162*** (0.0037)	0.0331*** (0.0058)
	Observations	152,379	152,379	152,379	46,829
Soft Drinks	Coefficient (Std.)	0.0099*** (0.0021)	0.0096*** (0.0021)	0.0099*** (0.0018)	0.0388*** (0.0028)
	Observations	1,350,618	1,350,618	1,350,618	156,004
Toothbrushes	Coefficient (Std.)	0.0129*** (0.0018)	0.0137*** (0.0018)	0.0137*** (0.0018)	0.0332*** (0.0047)
	Observations	125,380	125,380	125,380	24,955
Toothpastes	Coefficient (Std.)	0.0082*** (0.002)	0.0089*** (0.0016)	0.0088*** (0.0016)	0.0274*** (0.0046)
	Observations	264,317	264,317	264,317	56,842
Average coefficients		**0.0175**	**0.0146**	**0.0149**	**0.0291**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or equal to 15¢, and 0 otherwise. The main independent variable is the log of average sales volume of product i in store s over the sample period × the average of the price of product i in store s over the sample period. Column 1 reports the results of the baseline regression that includes only the log of average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix H. Producers' size and the robustness of the correlation between small price changes and sales volumes

Bhattarai and Shoenle (2014) report that large producers, i.e., producers that sell a large number of products, are more likely to have small price changes. Table H1 shows for each of the categories, the % of small price changes by quartiles of producers' size. To find the producers' size, in each category, we find the weekly average number of products per producer. We then average over all weeks to get the average number of products sold by each producer (Bhattarai and Shoenle, 2014).

We find that in our data, there is no clear pattern. Taking the average over all categories, we find that there are 33.23%, 29.48%, 28.64%, and 28.54% small price changes in the first, second, third, and fourth quartiles, respectively. Therefore, in our data, we do not find a correlation between small price changes and producers' size, perhaps because in our data decisions on the timing of price changes are made by the retailer rather than by the producers.

Nevertheless, we divide each category into quartiles by producers' size and estimate:

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(average\ sales\ volume_{i,s}\right) + month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \qquad \text{(H1)}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t* + 1 and the post change price remained unchanged for at least 2 weeks. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively. *u* is an i.i.d error term.

In Table H2 we report the estimation results. We find that for the first two quartiles, 28 out the 29 coefficients are positive. In the first quartile, 25 of the positive coefficients are statistically significant, and one more is marginally significant. In the second quartile, 24 of the positive coefficients are statistically significant.

In the third quartile, all 29 of the coefficients are statistically significant. 27 of them are statistically significant, and 2 more are marginally significant. In the fourth quartile, 27 of the coefficients are positive. 24 of the positive coefficients are statistically significant, and one more is marginally significant.

We also find that the sizes of the coefficients are similar across quartiles. The average coefficients are 0.026, 0.026, and 0.029 and 0.027 in the first, second, and third and fourth quartile, respectively.

As a final test, we consider the possibility that by calculating the producers' size at the category level, we might be underestimating the size of producers' that offer products in two or more categories. We, therefore, pool the data from all the product categories together.

Table H3 reports the results of regressions similar to the regressions we report in Table 6 in the paper. I.e.:

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(average\ sales\ volume_{i,s}\right) + \gamma \boldsymbol{X}_{i,s,t} + month_t + year_t + category_i + \delta_s + \mu_i + u_{i,s,t} \qquad \text{(H2)}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month*, *year* and *category* are fixed effects for the month of the price change, the year of the price change, and the product category. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term.

In column 1, the other extra control variables include the average weekly number of products per producer. The coefficient of the average sales volume is positive and statistically significant ($\beta = 0.027, p < 0.01$). It, therefore, seems that controlling for the size of the producers does not change our main finding: there is a positive correlation between the sales volume and the likelihood of a small price change.

In column 2, we also add a control for the percentage of the products that changed the price in the same week, excluding the current observation. This does not affect the coefficient of the average sales volume.

In column 3, we further add the average size of contemporaneous price changes, excluding the current observation. The coefficient of the average sales volume remains unaffected. In column 4, we add the percentage of the products that are produced by the same producer and that changed price in the same week, excluding the current observation. The coefficient of the average sales volume remains unaffected ($\beta = 0.027, p < 0.01$).

Table H1. Percentage of small price changes by quartiles

	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Analgesics	15.04%	12.31%	12.19%	11.69%
Bath Soaps	18.46%	9.98%	12.38%	16.81%
Bathroom Tissues	46.13%	33.03%	38.34%	50.17%
Beers	2.47%	3.95%	6.76%	8.48%
Bottled Juices	45.52%	36.06%	38.22%	29.14%
Canned Soups	58.63%	49.65%	48.05%	49.13%
Canned Tuna	61.09%	54.31%	55.64%	55.38%
Cereals	34.68%	28.89%	28.57%	32.99%
Cheese	64.29%	43.16%	33.49%	38.81%
Cigarettes	34.13%	29.13%	28.24%	25.09%
Cookies	27.28%	29.72%	23.85%	29.66%
Crackers	38.88%	48.10%	27.38%	23.88%
Dish Detergents	44.63%	41.61%	31.13%	31.20%
Fabric Softener	48.32%	28.68%	27.49%	28.86%
Front-End-Candies	59.34%	47.39%	43.92%	54.14%
Frozen Dinners	13.01%	23.86%	34.66%	20.28%
Frozen Entrees	20.46%	15.53%	15.19%	16.91%
Frozen Juices	30.44%	38.18%	42.51%	31.82%
Grooming Products	11.00%	10.97%	13.81%	14.41%
Laundry Detergents	27.60%	16.21%	16.62%	16.72%
Oatmeal	37.71%	46.51%	38.05%	40.84%
Paper Towels	55.84%	52.25%	52.61%	57.54%
Refrigerated Juices	32.12%	35.66%	32.95%	28.85%
Shampoos	7.41%	6.26%	7.82%	9.34%
Snack Cracker	38.75%	27.07%	20.87%	23.34%
Soaps	46.30%	49.18%	46.42%	38.02%
Soft Drinks	16.23%	13.71%	26.57%	9.06%
Toothbrushes	13.32%	8.16%	11.10%	12.68%
Toothpastes	14.64%	15.28%	15.86%	22.33%
Average	**33.23%**	**29.48%**	**28.64%**	**28.54%**

Notes: The table presents the % of small price changes in each quartile of producers' size by category. To calculate the quartiles of producers' size, we first calculate the size of each producer in each category by finding the number of products sold by each producer in each week and then averaging over all weeks. We then divide producers into quartiles using the average number of products they sell each week.

Table H2. Category-level regressions of small price changes, by quartiles of manufacturers' size

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0298*** (0.0091)	0.013** (0.0055)	0.0235*** (0.0065)	0.0338*** (0.0061)
	Observations	34,663	37,456	35,731	36,611
Bath Soap	Coefficient (Std.)	0.0359*** (0.0134)	0.0336** (0.0163)	0.0218* (0.0114)	0.0479** (0.0233)
	Observations	3,791	3,918	3,839	3,747
Bathroom Tissues	Coefficient (Std.)	0.0354*** (0.0099)	0.0904*** (0.0127)	0.0709*** (0.0165)	0.0306*** (0.0113)
	Observations	39,311	36,016	37,423	36,691
Beer	Coefficient (Std.)	0.0075*** (0.0017)	0.01*** (0.0015)	0.0153*** (0.0029)	0.0209*** (0.0031)
	Observations	73,377	73,587	71,340	72,316
Bottled Juice	Coefficient (Std.)	0.0126 (0.0088)	0.0303*** (0.0096)	0.0657*** (0.0092)	0.0313*** (0.008)
	Observations	130,866	123,821	118,687	123,183
Canned Soup	Coefficient (Std.)	0.0514*** (0.0087)	-0.0034 (0.0068)	0.0368*** (0.0065)	0.0204*** (0.0062)
	Observations	121,911	131,751	120,162	121,719
Canned Tuna	Coefficient (Std.)	0.0378*** (0.0081)	0.0071 (0.0081)	0.0241*** (0.0067)	0.0312*** (0.0093)
	Observations	55,961	58,140	50,991	47,951
Cereals	Coefficient (Std.)	0.0202*** (0.0073)	0.0229*** (0.0063)	0.0302*** (0.0064)	0.0202*** (0.0062)
	Observations	94,391	85,049	87,359	90,321
Cheese	Coefficient (Std.)	0.0264*** (0.0047)	0.0054 (0.0059)	0.0229*** (0.0041)	0.0283*** (0.005)
	Observations	151,338	221,454	202,915	220,443
Cigarettes	Coefficient (Std.)	-0.0025 (0.01)	0.0158** (0.0064)	0.0218*** (0.0063)	-0.0065 (0.0075)
	Observations	8,454	9,371	9,048	9,284
Cookies	Coefficient (Std.)	0.0193*** (0.0023)	0.0383*** (0.0042)	0.0264*** (0.0035)	0.0283*** (0.0043)
	Observations	189,332	160,793	168,919	169,717
Crackers	Coefficient (Std.)	0.0375*** (0.0048)	0.0325*** (0.0042)	0.0345*** (0.0055)	0.0538*** (0.0095)
	Observations	66,641	69,958	54,179	54,407
Dish Detergent	Coefficient (Std.)	0.0275*** (0.0093)	0.0455*** (0.0067)	0.0394*** (0.007)	0.0426*** (0.0059)
	Observations	50,346	48,380	46,539	44,368
Fabric Softener	Coefficient (Std.)	0.0326*** (0.012)	0.0375*** (0.0073)	0.029*** (0.0077)	0.0333*** (0.0096)
	Observations	51,749	42,994	44,935	41,378
Front-End-Candies	Coefficient (Std.)	0.0058 (0.0054)	0.0059 (0.0083)	0.0019 (0.0097)	-0.0165*** (0.0052)
	Observations	70,136	64,179	66,019	78,519
Frozen Dinners	Coefficient (Std.)	0.0443*** (0.0064)	0.0472*** (0.0083)	0.049*** (0.0079)	0.0294*** (0.0071)
	Observations	49,266	50,902	50,539	52,484

Table H2. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0271*** (0.0033)	0.0321*** (0.0041)	0.0178*** (0.0038)	0.0191*** (0.0042)
	Observations	231,065	205,922	218,170	209,675
Frozen Juices	Coefficient (Std.)	0.0168 (0.0116)	0.0268*** (0.0065)	0.0245*** (0.0071)	0.0449*** (0.0072)
	Observations	77,812	73,824	80,038	77,143
Grooming Products	Coefficient (Std.)	0.0143*** (0.0037)	0.0225*** (0.0038)	0.0213*** (0.0045)	0.0153*** (0.0048)
	Observations	66,700	65,306	66,455	71,412
Laundry Detergents	Coefficient (Std.)	0.0216*** (0.0065)	0.0205*** (0.0069)	0.0297*** (0.0061)	0.0096 (0.006)
	Observations	76,565	67,392	65,836	62,972
Oatmeal	Coefficient (Std.)	0.0437** (0.0207)	0.001 (0.0129)	0.0338*** (0.0146)	0.0171 (0.0113)
	Observations	20,184	21,624	19,863	18,312
Paper Towels	Coefficient (Std.)	0.0323** (0.0145)	0.0333** (0.0153)	0.0557** (0.0245)	0.0761*** (0.0178)
	Observations	26,835	31,117	29,325	28,927
Refrigerated Juices	Coefficient (Std.)	0.0289*** (0.0094)	0.0312*** (0.0071)	0.0256*** (0.008)	0.0358*** (0.0092)
	Observations	81,959	73,635	76,575	74,696
Shampoos	Coefficient (Std.)	0.0208*** (0.0032)	0.0095*** (0.0023)	0.0082*** (0.003)	0.0229*** (0.003)
	Observations	64,883	63,777	66,146	66,972
Snack Crackers	Coefficient (Std.)	0.0375*** (0.0063)	0.0403*** (0.0066)	0.0187*** (0.0049)	0.0264*** (0.005)
	Observations	100,802	108,690	97,783	91,390
Soaps	Coefficient (Std.)	0.0456*** (0.0078)	0.0437*** (0.0102)	0.0277** (0.0118)	0.0324*** (0.0115)
	Observations	39,742	39,140	38,084	35,413
Soft Drinks	Coefficient (Std.)	0.0211*** (0.0022)	0.0274*** (0.0026)	0.0257*** (0.0036)	0.0253*** (0.0032)
	Observations	346,043	355,732	350,552	298,291
Toothbrushes	Coefficient (Std.)	0.0211*** (0.0043)	0.0146*** (0.0052)	0.0256*** (0.0058)	0.0176*** (0.0075)
	Observations	33,948	27,258	32,415	31,759
Toothpastes	Coefficient (Std.)	0.0149*** (0.0052)	0.0198*** (0.0045)	0.0127*** (0.0048)	0.0089 (0.0063)
	Observations	64,984	63,457	68,506	67,370
Average coefficients		**0.0265**	**0.0260**	**0.0290**	**0.0269**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is “small price change,” which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. The regressions also include fixed effects for months, years, stores, and products. Columns 1, 2, 3, and 4 are for the 1st, 2nd, 3rd, and 4th quartiles of the manufacturers’ size, measured using the average number of products they sell each week. We estimate separate regressions for each product category, clustering the errors by product. * $p <$ 10%, ** $p <$ 5%, *** $p <$ 1%

Table H3. Pooled data regressions of small price changes and synchronization

	(1)	(2)	(3)	(4)
Log of sales volume	0.027***	0.027***	0.027***	0.027***
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	9,553,542	9,553,542	9,553,536	9,392,565

Notes: The table reports the results of pooled fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume product i in store s over the sample period. Column 1 reports the results of the baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, categories, stores, and products. In column 2, we add the average number of products each producer offers each week. In column 3, we add the percentage of the products that changed the price on the same week, excluding the current observation as an additional control. In column 4, we control synchronization by adding the percentage of the products that have been produced by the same producer and that changed price in the same week, excluding the current observation. We estimate a pooled regression, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix I. Results of cross-category analysis

Table I1 shows the number of all price changes and the number of small price changes $(\Delta P \leq 10¢)$ by product category, the percentage of small price changes out of all price changes, and the average sales volume. The latter is calculated by first finding the average weekly sales volume for each product in each store (*product-store*) in the category, and then averaging over all products.[4]

There is a large cross-category variation in the share of small price changes, ranging from 3.3% in the beer category to 55.2% in the paper towels category. This variation is accompanied by a large variation in the average sales volume. As shown in Figure I2 and table I4, the variation in the category-level average sales volume is mostly driven by the number of choices available to consumers. At the category level, a 1% increase in the number of products is associated with a 0.84% decrease in the expected average sales volumes.

More importantly, however, there is a strong correlation between the average sales volume and the share of small price changes. Figure I1 shows a scatterplot of the category-level average sales volume and the percentage of small price changes, along with a linear regression line (solid line). We find a positive correlation between the two variables. The correlation is even stronger (dashed line) if we exclude paper towels and bathroom tissues, two categories with particularly high values of both average sales volume and percentage of small price changes.

To explore this correlation formally, we run cross-category OLS regressions, where the dependent variable is the category-level percentage of small price changes. See Table I2. In column 1, the independent variable is the average weekly sales volume. The coefficient estimate of 0.95 implies that a one-unit increase in the average weekly sales volume is associated with a 0.95% increase in the percentage of small price changes.

A possible explanation for this correlation could be that categories with low average

[4] In calculating the average sales volume, we need to account for missing observations, because a missing observation in week *t* implies that the product was either out of stock or had 0 sales on that week. Thus, averaging over the available observations can lead to an upward bias for products that are sold in small numbers. Therefore, for each product in each store, we calculate the average by first determining the total number of units sold over all available observations. We then identify the first and last week for which we have observations, and calculate the average for each product-store as $\frac{total\ no.\ of\ units\ sold}{last\ week - first\ week}$. The resulting figure is smaller than we would obtain if we averaged over all available observations (which would not include observations on weeks with 0 sales).

price levels have higher shares of small price changes and higher sales volume. The regression in column 2 shows that there is indeed a negative correlation between the average price in a category and the percentage of small price changes. However, in column 3, which reports the results of a regression that includes both the average prices and the average sales volume as independent variables, we find that the coefficient of the average sales volume is 0.78 and statistically significant. Thus, we find that sales volume is correlated with small price changes even after controlling for the price level.

An alternative explanation could be competition. It could be that products in high sales volume categories face stronger competition, and their producers may want to avoid large price changes that could alienate consumers. On the other hand, it is also possible that competition would have a negative effect on the prevalence of small price changes. Wang and Werning (2022) argue that concentrated markets increase the likelihood of pricing complementarities. This suggests that small price changes might be more likely in markets where producers have greater market power.

In column 4, we look at the correlation between the percentage of small price changes and category-level estimates of own price elasticities which are taken from Hoch et al. (1995). We find that the correlation is negative, but not statistically significant. In column 5, where we report the results of a regression with both the sales volume and the price elasticity as independent variables, we find that the coefficient of the sales volume is 0.80, and statistically significant.

The coefficient of the elasticity is negative and statistically significant. I.e., small price changes are more common in product categories with low rather than high price elasticities (in absolute values), which is consistent with pricing complementarities. However, our results suggest that even after accounting for pricing complementarities, the effect of the sales volumes is positive and statistically significant.

As discussed above, table I1 shows that there is a large variation in the average sales volume across categories. In particular, the average weekly sales volume per store in the categories of bathroom tissues and paper towels, 40.35 and 38.92, respectively, stand out: they both are much larger than the average sales volumes in other categories. In contrast, the weekly average sales volume per store in the categories of bath soaps and shampoos, 0.72 and 0.84, are much smaller than the average in other categories.

To a large extent, these variations in the sales volume can be explained by product variety, which can be measured by looking at the number of Universal Product Codes (UPCs) in each category, which captures the number of options consumers can choose from. Table I3 gives the average sales volumes and the number of UPCs for each category.[5] Figure I2 illustrates that the average sales volume is negatively correlated with the number of UPCs. For example, the product categories with the highest sales volumes, bathroom tissues and paper towels, have a relatively small number of UPCs, 102 and 91, respectively. For comparison, the product categories with the lowest average sales volumes, bath soaps and shampoos, have 495 and 1,905 UPCs, respectively.

The negative correlation between the average sales volume and the number of UPCs is statistically significant. Table I4 reports the results of a category level linear regression of the log of the average sales volume on the log of the number of UPCs. According to the table, the correlation is statistically significant ($\beta = -0.84, p < 0.01$). Thus, a 1% increase in the number of UPCs per category is associated with a decrease of 0.84% in the average weekly sales volume per store.

Thus, the large variation in the sales volume should not be surprising. In categories with many UPCs, it appears that a large number of UPCs sell a small number of units, leading to a low average weekly sales volume per store.

[5] It turns out the Dominick's occasionally used different UPCs for the same products, perhaps because a product was re-launched (Mehrhoff, 2018). Whenever possible, we treat re-launches as the same product and, consequently, the number of products that we report might differ from the number reported in previous studies, e.g., Chen et al. (2008). See also the Dominick's data manual (https://www.chicagobooth.edu/-/media/enterprise/centers/kilts/datasets/dominicks-dataset/dominicks-manual-and-codebook_kiltscenter.aspx), p. 9.

Table I1. The proportion of small price changes and the average sales volume by product categories

Product Category	All price changes (1)	Small price changes (2)	% of small price changes (3)	Average sales volume (4)
Analgesics	144,461	16,608	11.5%	1.24
Bath soap	15,295	1,783	11.7%	0.72
Bathroom tissues	149,441	60,263	40.3%	40.35
Beer	290,620	9,526	3.3%	3.58
Bottled juices	496,557	170,762	34.4%	8.27
Canned soups	495,543	281,649	56.8%	12.25
Canned tuna	213,043	111,473	52.3%	9.34
Cereals	357,120	112,298	31.4%	15.02
Cheese	796,150	309,021	38.8%	11.32
Cigarettes	36,157	10,527	29.1%	21.20
Cookies	688,761	161,826	23.5%	4.96
Crackers	245,185	77,658	31.7%	4.89
Dish detergents	189,633	67,109	35.4%	7.38
Fabric softeners	181,056	55,199	30.5%	5.56
Front end candies	278,853	124,432	44.6%	10.70
Frozen dinners	203,191	45,050	22.2%	5.64
Frozen entrees	864,832	127,039	14.7%	6.32
Frozen juices	308,817	106,398	34.5%	16.82
Grooming products	269,873	24,172	9.0%	1.21
Laundry detergents	272,765	51,739	19.0%	6.59
Oatmeal	79,983	34,271	42.8%	7.32
Paper towels	116,204	64,183	55.2%	38.92
Refrigerated juices	306,865	91,124	29.7%	19.80
Shampoos	261,778	14,228	5.4%	0.84
Snack crackers	398,665	93,754	23.5%	6.79
Soaps	152,379	60,635	39.8%	5.02
Soft drinks	1,350,618	206,373	15.3%	13.05
Toothbrushes	125,380	13,306	10.6%	2.09
Toothpastes	264,317	38,894	14.7%	3.31
Total	9,553,542	2,541,300	26.6%	10.02

Notes: Column 1 presents the total number of price changes in each category. Column 2 presents the number of small price changes $(\Delta P \leq 10¢)$. Column 3 presents the % of small price changes out of all price changes. Column 4 presents the average number of units sold per product, per week, per store. The average number of units sold is calculated taking into account that missing observations often imply 0 sales.

Table I2. Cross-category regression of the % of small price changes and sales volume

	(1)	(2)	(3)	(4)	(5)
Average sales volume	0.95***		0.78**		0.80***
	(0.262)		(0.270)		(0.268)
Average price		–4.59**	–2.88*		
		(1.703)	(1.621)		
Absolute elasticity				–7.78	–11.53**
				(6.208)	(5.223)
Constant	19.29***	45.65***	28.85***	44.93***	40.97***
	(3.319)	(5.327)	(6.249)	(10.504)	(8.681)
R^2	0.33	0.21	0.40	0.09	0.43
Number of categories	29	29	29	18	18

Notes: The table presents the results of OLS regressions. The dependent variable is the % of small price changes out of all price changes, in each of the 29 categories. Small price changes are defined as price changes of $\Delta P \leq 10¢$. The average price is the average price in the product category. The absolute elasticity is the absolute value of the demand price elasticity estimates as reported by Hoch et al. (1995). Columns (4) and (5) contain only 18 observations because Hoch et al. (1995) provide elasticity estimates only for 18 of the 29 product categories. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table I3. Category-level average sales volume and the number of UPCs

Product Category	Average sales volume (1)	Number of UPCs (2)
Analgesics	1.24	507
Bath soap	0.72	495
Bathroom tissues	40.35	102
Beer	3.58	653
Bottled juices	8.27	445
Canned soups	12.25	413
Canned tuna	9.34	212
Cereals	15.02	399
Cheese	11.32	573
Cigarettes	21.20	78
Cookies	4.96	976
Crackers	4.89	295
Dish detergents	7.38	183
Fabric softeners	5.56	203
Front end candies	10.70	416
Frozen dinners	5.64	254
Frozen entrees	6.32	822
Frozen juices	16.82	161
Grooming products	1.21	962
Laundry detergents	6.59	353
Oatmeal	7.32	93
Paper towels	38.92	91
Refrigerated juices	19.80	227
Shampoos	0.84	1,905
Snack crackers	6.79	382
Soaps	5.02	1,370
Soft drinks	13.05	243
Toothbrushes	2.09	325
Toothpastes	3.31	376
Average	**10.02**	**466.00**

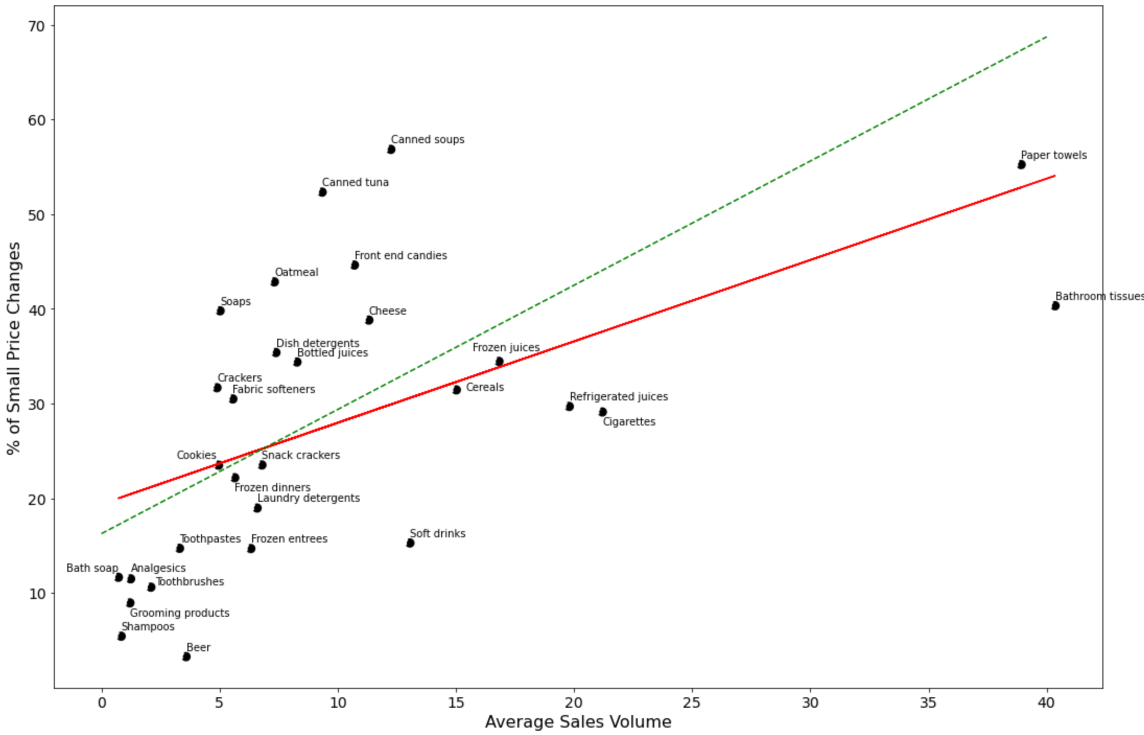
Notes: Column 1 presents the average number of units sold per product, per week, per store. Column 2 presents the number of UPCs in each product category.

Table I4. Average sales volume and the number of UPCs

	ln (average sales volume)
ln (Number of UPCs)	−0.84***
	(0.186)
Constant	6.77***
	(1.098)
R^2	0.35
Observations	29

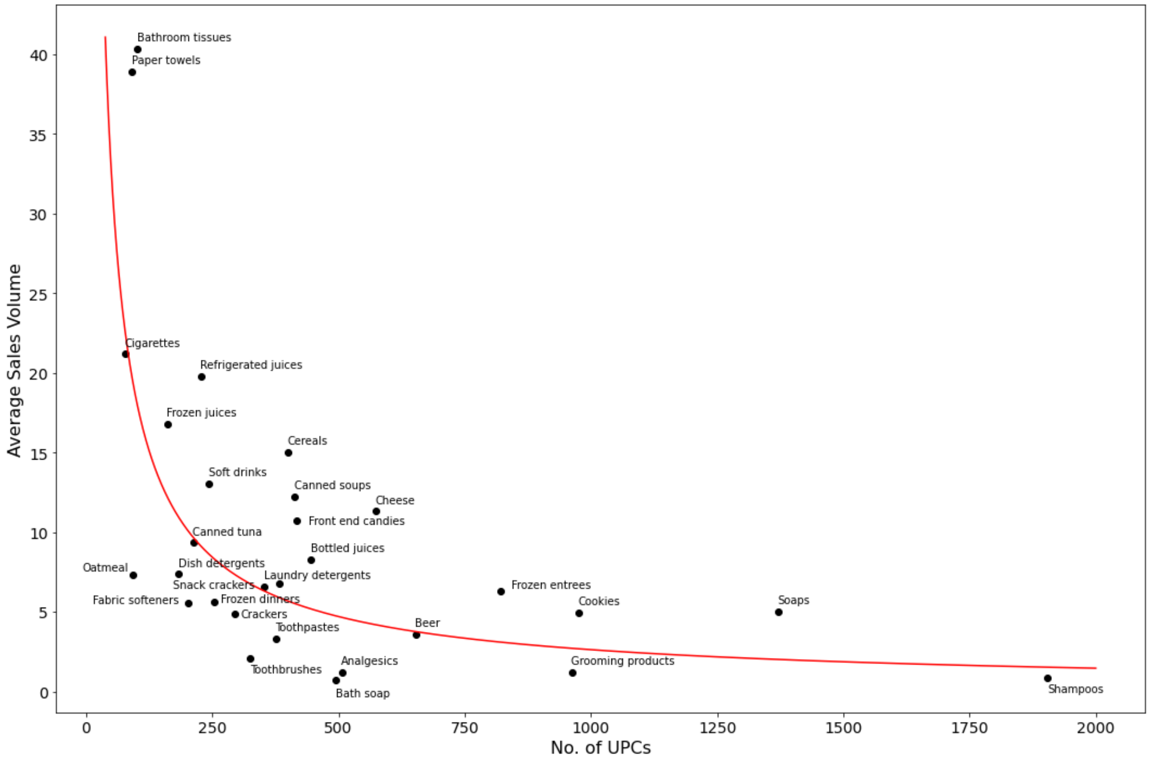
Notes: The table reports the results of a category-level linear regression with robust standard errors. The dependent variable is the log of the average weekly sales volume per store. The independent variable is the log of the number of UPCs in each category. Standard errors are in parentheses. *** $p < 0.01$.

Figure I1. Cross-category correlation between small price changes and sales volume



Notes: The red solid line is a linear regression line when all 29 product categories are included. The dotted green line is the linear regression line when two categories, paper towels and bathroom tissues, are excluded.

Figure I2. Average sales volume and the number of UPCs



Notes: The *y*-axis gives the average weekly sales volume per store in each of the 29 categories. The *x*-axis gives the number of UPCs per category. The red line gives the prediction line based on a log-log regression specification.

Appendix J. Sales volume, markup, and small price changes

Our results suggest that small price changes should be relatively common for products with high sales volumes. Yet, in the marketplace there are products with high sales volumes that rarely have small price changes. One example is the iPhone.

A possible explanation is that the likelihood of small price changes is negatively correlated with markups. It is possible that sellers that have high markups are less likely to make small price changes, because the effect of a small price change on the profits of a firm with high markup could be small in percentage terms.

To check this, we take advantage of the fact that Dominick's data contain a proxy for the products' markup (Barsky et al., 2003), and thus estimate a regression that is similar to regression (1) in the paper:

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(average\ sales\ volume_{i,s}\right) + \beta_2\left(average\ markup_{i,s}\right) + month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \quad \text{(J1)}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less than or equal to 10¢, and 0 otherwise. As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t* + 1 and the post change price remained unchanged for at least 2 weeks. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. The *average markup* is the average markup of product *i* in store *s* over the sample period. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term.

The results are summarized in Table J1. Panel A gives information about the coefficients of the sales volumes in each of the 29 product categories. We find that all 29 coefficients are positive. 15 of the coefficients are statistically significant, and 1 more is marginally significant. Panel B gives information about the coefficients of the markup. We find that consistent with the hypothesis that a high markup is associated with a lower frequency of small price changes, the coefficients of the markup are negative in 21 of the 29 product categories, 13 of them statistically significant.

The results, therefore, suggest that there is, indeed, a negative correlation between markups and the frequency of small price changes. Adding the markups to the regression, however, does not affect our main finding. There is a positive correlation between sales volumes and small price changes.

Table J1. Sales volume, markup, and small price changes

Category	Sales Volume		Markup		No. of Observations
	Coefficient	Std.	Coefficient	Std.	
Analgesics	0.0163***	0.0040	-0.1157***	0.0371	74,451
Bath Soap	0.01	0.0129	0.1211	0.1138	6,649
Bathroom Tissues	0.0392***	0.0086	-0.2302***	0.0373	56,445
Beer	0.0021***	0.0007	0.0001	0.0011	178,518
Bottled Juice	0.0314***	0.0075	-0.2746***	0.0568	224,857
Canned Soup	0.0017	0.0090	0.0011	0.0692	233,778
Canned Tuna	0.0032	0.0061	-0.3597***	0.0694	112,628
Cereals	0.0048	0.0065	-0.0681	0.0497	141,082
Cheese	0.0109***	0.0036	-0.6253***	0.0790	357,679
Cigarettes	0.0037	0.0050	0.1909***	0.0358	24,553
Cookies	0.0086***	0.0019	-0.0247	0.0376	317,932
Crackers	0.0012	0.0033	-0.1905***	0.0575	115,657
Dish Detergent	0.028***	0.0064	-0.4664***	0.1218	85,222
Fabric Softener	0.0085	0.0065	-0.4819***	0.1307	85,337
Front-End-Candies	0.0098**	0.0041	-0.1295	0.0908	148,200
Frozen Dinners	0.0517***	0.0069	-0.1548	0.1058	52,893
Frozen Entrees	0.0227***	0.0026	-0.19***	0.0476	345,223
Frozen Juices	0.0181**	0.0071	-0.3513***	0.1189	118,582
Grooming Products	0.0095***	0.0033	0.0302	0.0290	101,918
Laundry Detergents	0.0189***	0.0045	-0.1422***	0.0328	121,539
Oatmeal	0.016	0.0123	0.0513	0.0870	25,513
Paper Towels	0.0113	0.0141	-0.7104***	0.1077	48,198
Refrigerated Juices	0.0129*	0.0077	-0.052	0.0665	108,964
Shampoos	0.01***	0.0025	-0.0067	0.0121	88,163
Snack Crackers	0.0023	0.0029	-0.0868	0.0654	176,527
Soap	0.0258***	0.0088	-0.1312	0.0943	56,725
Soft Drinks	0.0306***	0.0045	0.0029	0.0026	230,185
Toothbrushes	0.0137***	0.0046	-0.1526***	0.0578	52,181
Toothpastes	0.0015	0.0039	0.0412	0.0296	100,831
Average	**0.0146**	**0.0059**	**-0.1554**	**0.0636**	**746,413**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢. The main independent variables are the log of the average sales volume of product *i* in store *s* over the sample period, and the average markup of product *i* in store *s* over the sample period. The regressions also include fixed effects for months, years, stores, and products. The LHS panel reports the coefficient of the average sales volume. The RHS panel reports the coefficient of the average markups. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix K. Category level correlation between sales volumes and the size of price changes

Figure 2 in the paper uses deciles plot to illustrate the correlation between sales volumes and the size of small price changes when we pool data from all categories. Figure K1 illustrates the correlation between sales volumes and the size of small price changes at the category level. The figure depicts, for each category, the scatter plots of the size of price changes, in cents, on the *x*-axis, vs. the average sales volume, on the *y*-axis. The average sales volume is calculated at the store-product level, i.e., for individual goods at each store.

The figure shows that the relationship tends to have a pyramid shape – broad at the bottom, suggesting that relatively large price changes occur at all levels of sales volumes. Small price changes, however, are more likely to occur when the sales volume is high, yielding the pyramid shape.

Figure K1. Sales volume and small price changes

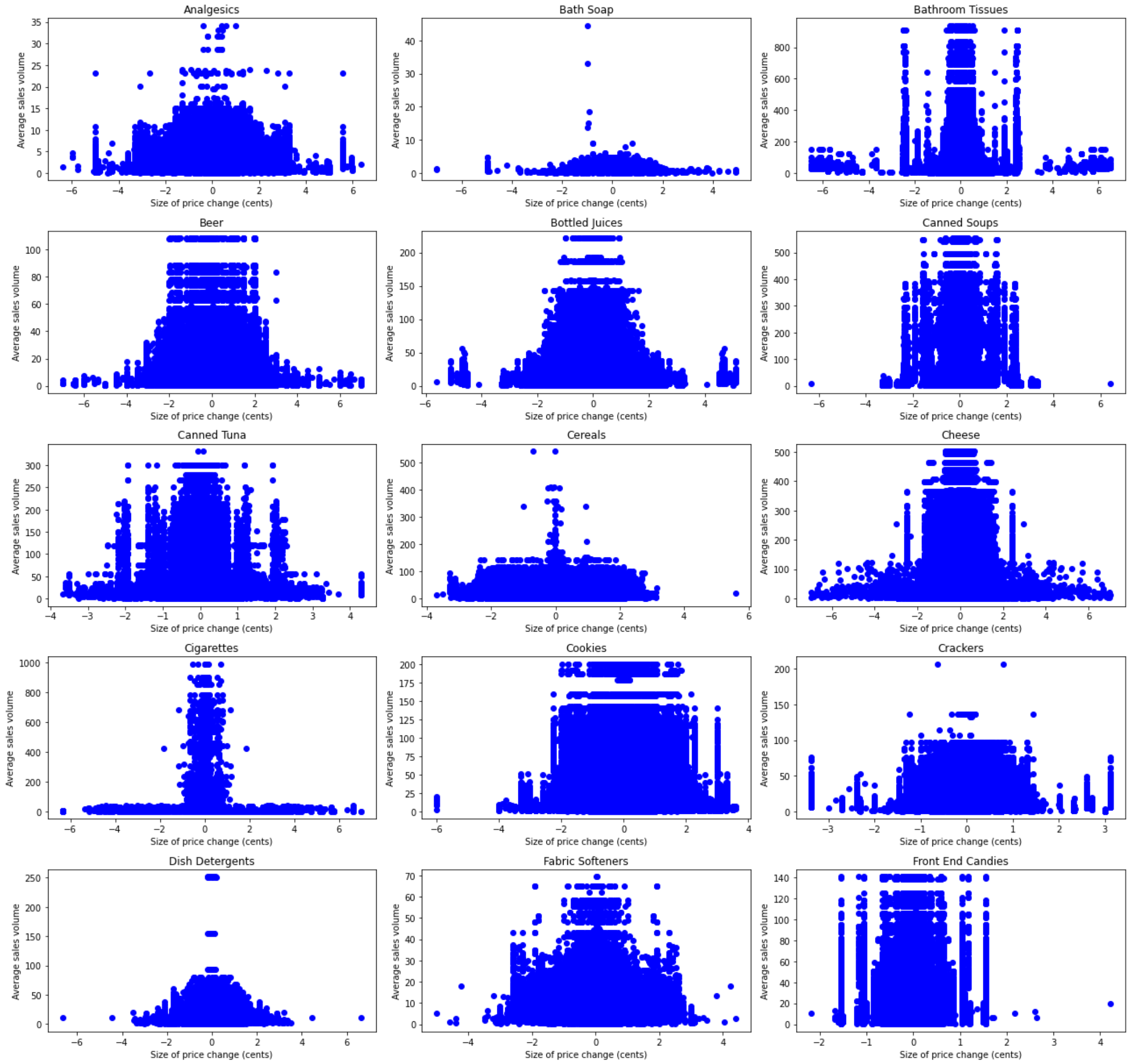
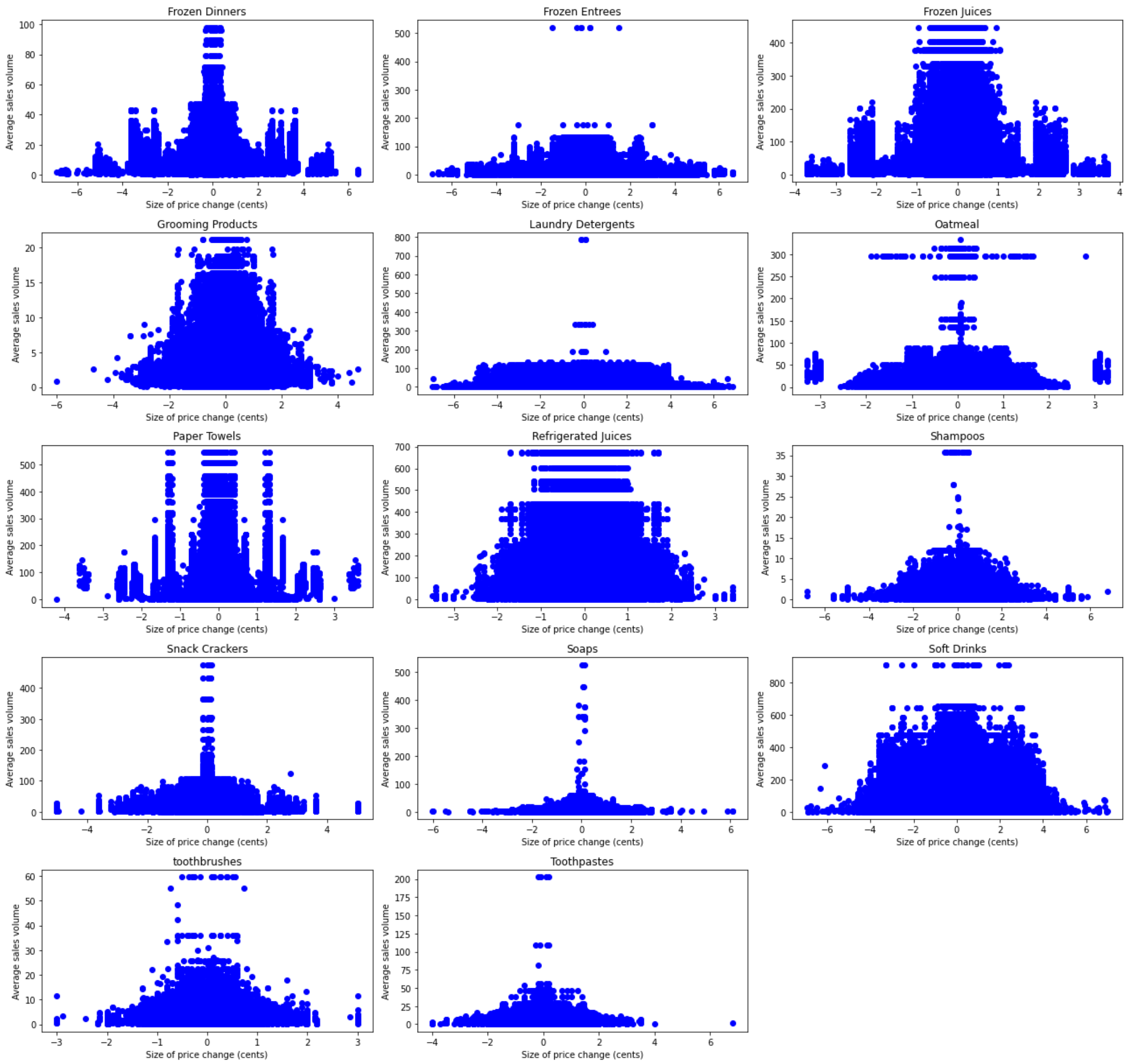


Figure K1. (cont.)



Notes: The figure depicts, for each of the 29 product categories, the correlation between the size of price changes (x-axis) and the average sales volume (y-axis). The average sales volume is calculated separately for each product in each store.

Appendix L. Frequency of price changes by size for high, medium, and low sales volume products – in percentage terms

In the paper, we present Figure 3, which shows that within product categories, price changes in general, and small price changes in particular, are more common among high sales volume products than among middle and low sales volume products. In Figure 3, we measure the size of price changes in cents. However, this has the disadvantage that some price changes that are multiples of 10 cents are much more frequent than other price changes.

In addition, when we measure the size of price changes by cents, we might identify a price change as small because its size is less than 10 cents. In percentage terms, however, this price change might be large. E.g., if a good costs less than 1 dollar.

We therefore generate a figure similar to figure 3, but this time we measure the size of price changes in percentage terms. To draw the figure, we first compute for each product in each store, the average sales volume over the entire sample period. By taking the average over a long period, we obtain an estimate of the expected sales volume that does not depend on transitory shocks or sales. We then group the products into high, medium and low sales volume products. Low sales volume products are products with average sales volume in the lower third of the distribution, high sales volume products have sales volume in the higher third of the distribution, and medium sales volume products have sales volume in between.

Figure L1 shows, for every product category, the frequency of price changes for each size of price change from 1% to 30%. As we do in the paper, we use observations on price changes only if we observe the price in both weeks t and $t + 1$ and the post change price remained unchanged for at least 2 weeks.

The red dashed line depicts the frequency of price changes among high sales volume products, the green dotted line depicts the frequency of price changes among middle sales volume products, while the blue solid line depicts the frequency of price changes among low sales volume products. The shaded area marks the range of small price changes, $\Delta P \leq 5\%$.

We find that in comparison to Figure 3 in the paper, the lines on Figure L1 are smoother, without the peaks at multiples of 10 cents. However, in some categories, there are small peaks, particularly at 20% and 25%, perhaps because sale prices and discounts are often set in percentage terms.

We also find that similar to Figure 3 in the paper, price changes are more common among high sales volume products, and least common among low sales volume products. Focusing on the shaded area, we see that the frequency of small price changes is far greater among the high sales-volume products than among low sales volume products. Indeed, for high sales volume products, in most product categories, the frequency of small price changes exceeds the frequency of large price changes. This is far less common, and less dramatic, among low sales volume products. For the middle sales volume products, the frequency of price changes, and the frequency of small price changes in particular, is in general in between the frequencies of the low and high sales volume products.

Figure L1. Frequency of price changes by size, in % terms, for high, middle, and low sales volume products

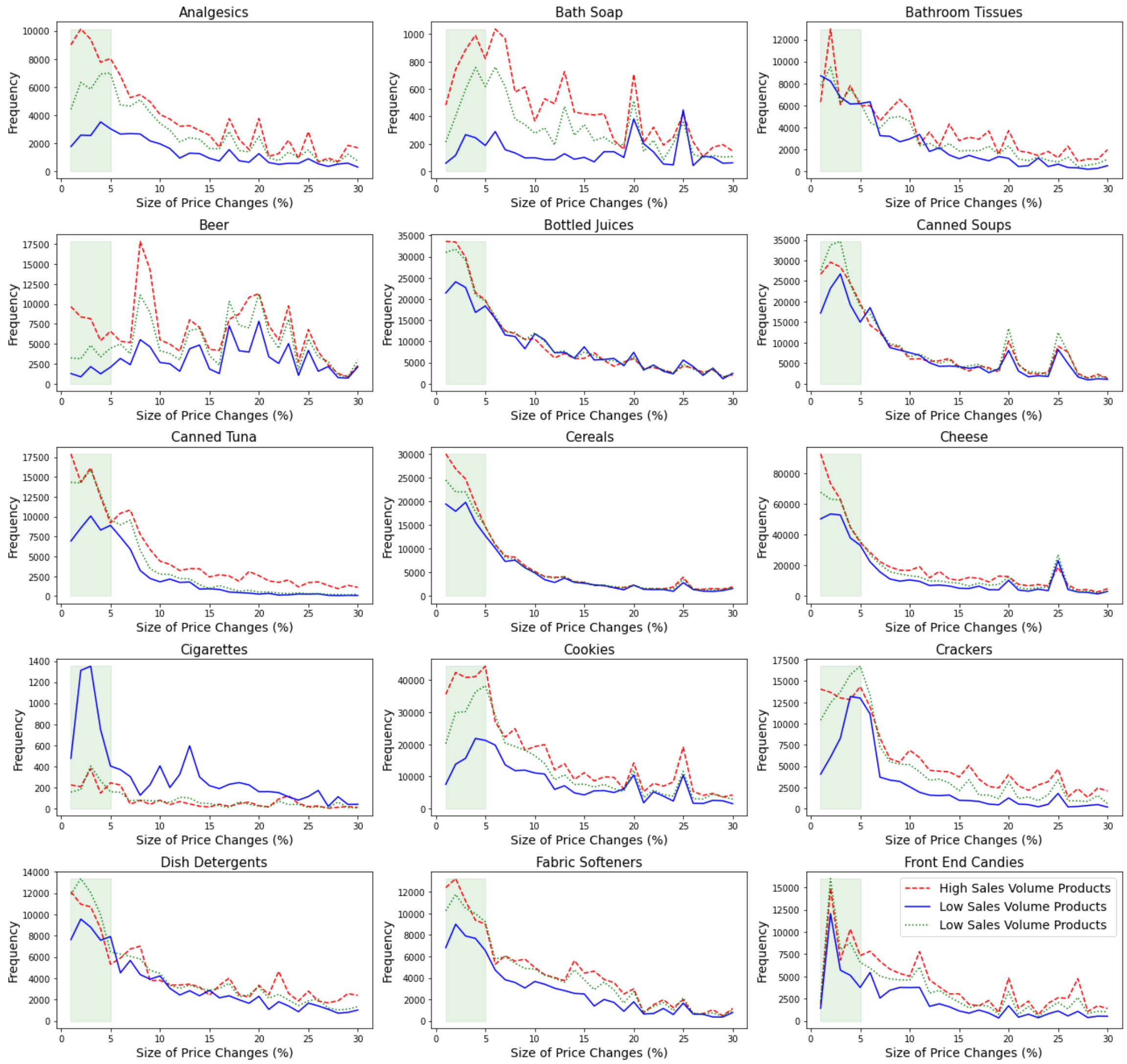
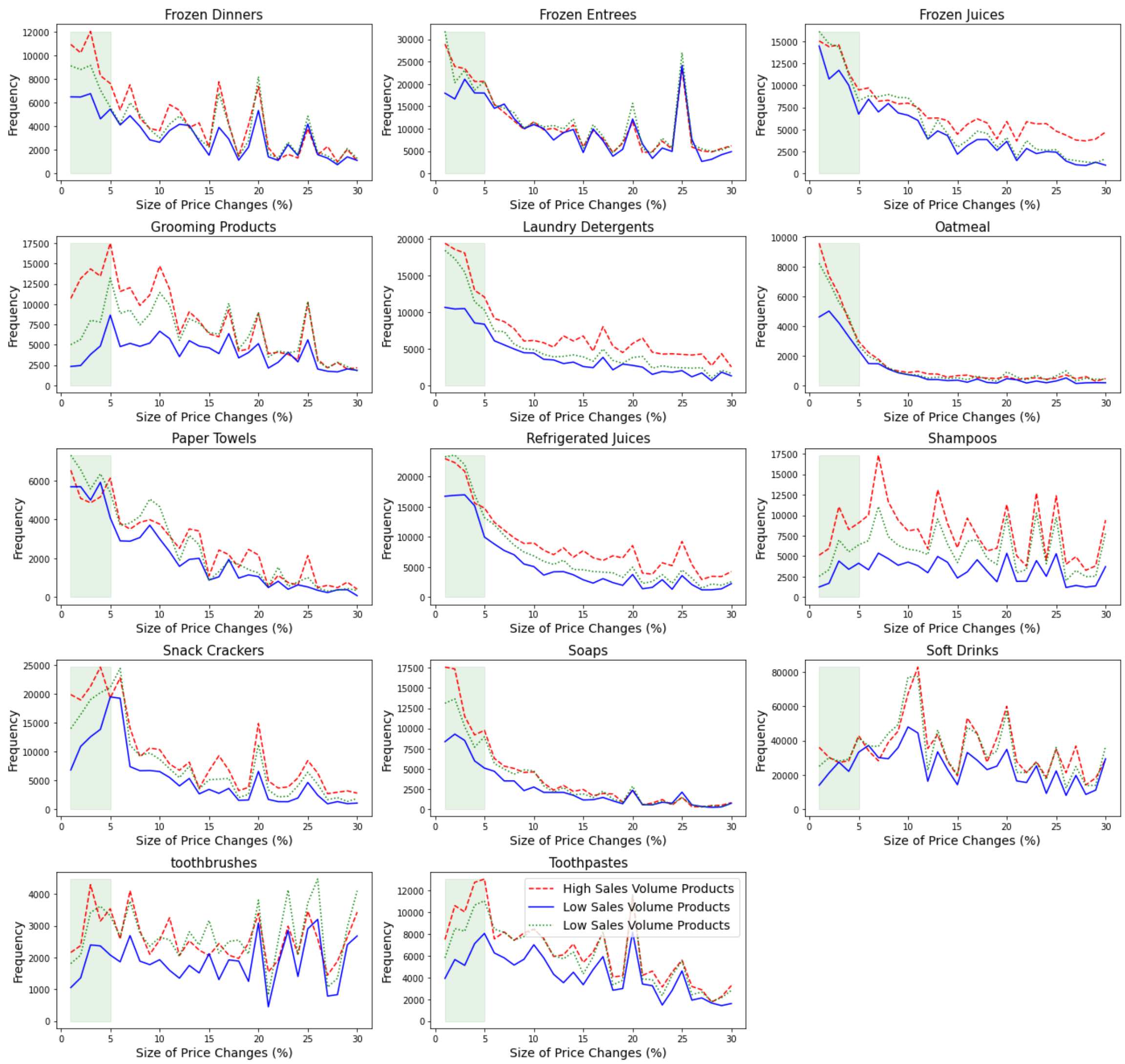


Figure L1 (cont.).



Notes: For each category, the figure shows the frequency of price changes for each size of price change from 1% to 30%, comparing high sales volume products to medium and low sales volume products. To obtain the figures, we compute the average sales volume over the entire sample period for each product, in each store. We then group the products into high, medium, and low sales volume products. High (low) sales volume products are products in the high (low) third of the distribution. Medium sales volume products fall in between. The *y*-axis shows the frequency of price changes. The red dashed line depicts the frequency of price changes for the high sales-volume products, the green dotted line depicts the frequency of price changes for the medium sales-volume products, and the blue solid line depicts the frequency of price changes for the low sales volume products. The shaded area marks the range of small price changes, $\Delta P \leq 5\%$.

Appendix M. National brand vs. private label products

It is possible that the correlation between small price changes and sales volumes is an artifact of differences in the patterns of demand between products. In this appendix, therefore, we separate private label and national brand products and analyze them separately, because they tend to have different price levels and different patterns of demand. If our results are an artifact of the pattern of demands, then it is possible that sales volumes would have a different effect on private label products than on national brands.

In the first analysis, we use all price changes, conditional on observing the price one-week before the price change. We then re-estimate the model, using only observations on price changes if the post-change price remained unchanged for at least two weeks. The second analysis is consistent with our analysis in the paper and in the other appendices. However, it has the disadvantage of having too few observations on private label products' price changes, leading to imprecise estimates.

Focusing first on all price changes, Table M1 (M2) presents the results of regressions equivalent to the regressions in Table 3 in the paper. This time, however, we focus on national brand (private label) products. The regressions take the following form:

$$\begin{aligned} small\ price\ change_{i,s,t} &= \alpha + \beta \ln(average\ sales\ volume_{i,s}) + \gamma \mathbf{X}_{i,s,t} \\ &+ month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \end{aligned} \qquad \text{(M1)}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product.

The values in Table M1 are the coefficients of the log of the average sales volume when we focus on the sample of national brand products. In column 1, the only control variables are the log of the average sales volume, and dummies for months, years, stores, and products. Consistent with the results we report in the paper, we find that all the coefficients of the log of the average sales volume are positive. 29 of the 29 coefficients are positive, and 28 of them are statistically significant. The only exception is the coefficient of the highly regulated cigarettes category. The average coefficient is 0.036, suggesting that a 1% increase in the sales volume is associated with a 3.6% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). All the coefficients are positive and statistically significant: 27 at the 1% level, and two at the 10% level. The average coefficient is 0.029, suggesting that a 1% increase in the sales volume is associated with a 2.9% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. All coefficients remain positive and statistically significant: 27 at the 1% level, and two at the 10% level. The average coefficient is 0.025, suggesting that a 1% increase in the sales volume is associated with a 2.5% increase in the likelihood of a small price change.

As a further control, in column 4 we focus on regular prices by excluding all sale and bounce-back prices. When we focus on regular prices, all the coefficients are positive and 28 statistically significant at the 1% level. The average coefficient is 0.045, suggesting that a 1% increase in the sales volume is associated with a 4.5% increase in the likelihood of a small price change.

The values in Table M2 are the coefficients of the log of the average sales volume when we use the sample of private label products. When we focus on private labels, we are left with 24 product categories, because in five categories, which include beers, cigarettes, front-end-candies, frozen dinners and soaps, we have less than 500 observations on private labels.

In column 1, the only control variables are the log of the average sales volume, and dummies for months, years, stores, and products. Consistent with the results we report in the paper, we find that 23 of the 24 estimated coefficients of the log of the average sales volume are positive. 19 of the positive coefficients are statistically significant, and one more is marginally statistically significant. The one negative coefficient (toothbrushes category) is not statistically significant. The average coefficient is 0.039, suggesting that a 1% increase in the sales volume is associated with a 3.9% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). 23 of the 24 coefficients are positive. 15 of the positive coefficients are statistically significant, and one more is marginally statistically significant. The one negative coefficient (toothbrushes category) is not statistically significant. The average coefficient is 0.030, suggesting that a 1% increase in the sales volume is associated with a 3.0% increase in the likelihood of a small price change.

In column 3, we also add a control for 9-ending prices. Again, 23 of the 24 coefficients are positive. 13 of the positive coefficients are statistically significant, and one more is marginally statistically significant. The one negative coefficient (toothbrushes) is not statistically significant. The average coefficient is 0.024, suggesting that a 1% increase in the sales volume is associated with a 2.4% increase in the likelihood of a small price change.

As a further control for a possible effect of sales on the results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, all the coefficients are positive. 14 of the positive coefficients are statistically significant, and 5 more are marginally statistically significant. The average coefficient is 0.047, suggesting that a 1% increase in the sales volume is associated with a 4.7% increase in the likelihood of a small price change.

We, therefore, find that sales volumes are positively correlated with the likelihood of small price changes among private label products as well as among national brand products.

Focusing on price changes only if the post-change price survived for at least two weeks, Table M3 (M4) presents the results of regressions equivalent to the regressions in Table 3 in the paper. This time, however, we focus on national brand (private label) products.

In column 1 of Table M3, the control variables are the log of the average sales volume, and dummies for months, years, stores, and products. We find that all 29 coefficients of the log of the average sales volume are positive. 17 of the positive coefficients are statistically significant, and 4 more are marginally significant. The average coefficient is 0.016, suggesting that a 1% increase in the sales volume is associated with a 1.6% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). 26 of the coefficients are positive. 18 of them are statistically significant, and one more is significant at the 10% level. The average coefficient is 0.009, suggesting that a 1% increase in the sales volume is associated with a 0.9% increase in the likelihood of a small price change.

In column 3, we add a control for 9-ending prices. 26 of the coefficients are positive. 13 of them are statistically significant, and 3 more are significant at the 10% level. The average coefficient is 0.009, suggesting that a 1% increase in the sales volume is associated with a 0.9% increase in the likelihood of a small price change.

As a further control, in column 4 we focus on regular prices by excluding all sale and bounce-back prices. 28 of the coefficients are positive. 16 of them are statistically significant, and 3 more are significant at the 10% level. The average coefficient is 0.020, suggesting that a 1% increase in the sales volume is associated with a 2.0% increase in the likelihood of a small price change.

The values in Table M4 are the coefficients of the log of the average sales volume when we use the sample of private-label products. When we focus on private labels, the estimation is imprecise because in many categories we only have a small number of observations. Consequently, we are left with 23 product categories, because in 6 categories, which include bath-soaps, beers, cigarettes, front-end-candies, frozen dinners and soaps, we have less than 500 observations on price changes.

In column 1, the control variables are the log of the average sales volume, and dummies for months, years, stores, and products. We find that 15 of the 23 estimated coefficients of the log of the average sales volume are positive. 5 of the positive coefficients are statistically significant, and 3 more are marginally statistically significant. One of the negative coefficients (cereals) is statistically significant. The average coefficient is 0.013, suggesting that a 1% increase in the sales volume is associated with a

1.3% decrease in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). 12 of the 23 coefficients are positive. 3 of the positive coefficients are statistically significant, and 4 more are marginally statistically significant. 2 of the negative coefficients (cereals and refrigerated juices) are statistically significant. The average coefficient is 0.007, suggesting that a 1% increase in the sales volume is associated with a 0.7% decrease in the likelihood of a small price change.

In column 3, we add a control for 9-ending prices. 12 of the 23 coefficients are positive. 4 of the positive coefficients are statistically significant, and 1 more is marginally statistically significant. 2 of the negative coefficients (cereals and refrigerated juices) are statistically significant. The average coefficient is 0.007, suggesting that a 1% increase in the sales volume is associated with a 0.7% decrease in the likelihood of a small price change.

As a further control for a possible effect of sales on the estimation results, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. 12 of the 23 coefficients are positive. 5 of the positive coefficients are statistically significant, and 1 more is marginally statistically significant. 2 of the negative coefficients (cereals and refrigerated juices) are statistically significant. The average coefficient is 0.014, suggesting that a 1% increase in the sales volume is associated with a 1.4% decrease in the likelihood of a small price change.

Table M1. Category-level regressions of small price changes and sales volume, using observations on national brand products

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0379*** (0.0038)	0.0305*** (0.0031)	0.0254*** (0.0029)	0.0481*** (0.0063)
	Observations	242,823	242,823	242,823	64,271
Bath Soap	Coefficient (Std.)	0.0455*** (0.0101)	0.0502*** (0.0102)	0.0471*** (0.0099)	0.0892*** (0.0167)
	Observations	30,747	30,747	30,747	6,285
Bathroom Tissues	Coefficient (Std.)	0.0357*** (0.0057)	0.0178*** (0.0052)	0.0155*** (0.0049)	0.0335*** (0.0071)
	Observations	305,784	305,784	305,784	75,080
Beer	Coefficient (Std.)	0.023*** (0.0015)	0.0249*** (0.0012)	0.0208*** (0.0012)	0.0687*** (0.005)
	Observations	457,795	457,795	457,795	56,283
Bottled Juice	Coefficient (Std.)	0.0552*** (0.0049)	0.037*** (0.0034)	0.0326*** (0.0035)	0.0322*** (0.005)
	Observations	838,222	838,222	838,222	212,093
Canned Soup	Coefficient (Std.)	0.0265*** (0.0044)	0.0146*** (0.0037)	0.0154*** (0.0035)	0.021*** (0.0042)
	Observations	890,105	890,105	890,105	260,495
Canned Tuna	Coefficient (Std.)	0.0353*** (0.0052)	0.026*** (0.0044)	0.0221*** (0.0041)	0.0323*** (0.0048)
	Observations	355,663	355,663	355,663	110,267
Cereals	Coefficient (Std.)	0.0235*** (0.0028)	0.019*** (0.0023)	0.0184*** (0.0023)	0.0264*** (0.0038)
	Observations	641,499	641,499	641,499	244,435
Cheese	Coefficient (Std.)	0.0382*** (0.0032)	0.0215*** (0.0024)	0.0184*** (0.0024)	0.01*** (0.0032)
	Observations	1,382,175	1,382,175	1,382,175	452,595
Cigarettes	Coefficient (Std.)	0.0152 (0.0093)	0.0154 (0.0082)	0.0151* (0.008)	0.0141 (0.0086)
	Observations	6,982	6,982	6,982	4,120
Cookies	Coefficient (Std.)	0.0419*** (0.0019)	0.0369*** (0.0018)	0.0317*** (0.0017)	0.0536*** (0.0032)
	Observations	1,172,710	1,172,710	1,172,710	202,932
Crackers	Coefficient (Std.)	0.0545*** (0.0036)	0.0432*** (0.0033)	0.0392*** (0.0031)	0.0545*** (0.0065)
	Observations	440,282	440,282	440,282	83,083
Dish Detergent	Coefficient (Std.)	0.0507*** (0.0039)	0.0359*** (0.0031)	0.0312*** (0.0031)	0.0405*** (0.0047)
	Observations	338,430	338,430	338,430	84,418
Fabric Softener	Coefficient (Std.)	0.0327*** (0.0039)	0.0215*** (0.0036)	0.0183*** (0.0037)	0.0383*** (0.0051)
	Observations	318,661	318,661	318,661	88,496
Front-End-Candies	Coefficient (Std.)	0.0166*** (0.0039)	0.0092*** (0.0028)	0.0082*** (0.0027)	0.0114*** (0.0032)
	Observations	485,323	485,323	485,323	153,759
Frozen Dinners	Coefficient (Std.)	0.0534*** (0.0027)	0.0405*** (0.0024)	0.0391*** (0.0024)	0.0902*** (0.0059)
	Observations	502,329	502,329	502,329	72,589

Table M1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0352*** (0.0019)	0.0298*** (0.0017)	0.029*** (0.0017)	0.0589*** (0.0032)
	Observations	1,835,884	1,835,884	1,835,884	351,172
Frozen Juices	Coefficient (Std.)	0.0329*** (0.0037)	0.0256*** (0.0032)	0.023*** (0.0031)	0.0295*** (0.0047)
	Observations	540,070	540,070	540,070	128,103
Grooming Products	Coefficient (Std.)	0.0421*** (0.0024)	0.0451*** (0.0022)	0.0387*** (0.0022)	0.0651*** (0.0061)
	Observations	639,004	639,004	639,004	94,837
Laundry Detergents	Coefficient (Std.)	0.0188*** (0.0029)	0.015*** (0.0025)	0.012*** (0.0023)	0.0238*** (0.0049)
	Observations	544,928	544,928	544,928	137,209
Oatmeal	Coefficient (Std.)	0.0284*** (0.0079)	0.0177*** (0.0057)	0.0155*** (0.0056)	0.0291*** (0.0093)
	Observations	146,887	146,887	146,887	59,961
Paper Towels	Coefficient (Std.)	0.0381*** (0.0125)	0.0264* (0.0133)	0.0252* (0.0136)	0.0292*** (0.0104)
	Observations	216,280	216,280	216,280	47,035
Refrigerated Juices	Coefficient (Std.)	0.0312*** (0.0034)	0.0205*** (0.0028)	0.018*** (0.0027)	0.0291*** (0.0044)
	Observations	716,448	716,448	716,448	147,024
Shampoos	Coefficient (Std.)	0.0328*** (0.0014)	0.0373*** (0.0014)	0.0324*** (0.0013)	0.0675*** (0.0043)
	Observations	701,525	701,525	701,525	85,168
Snack Crackers	Coefficient (Std.)	0.0431*** (0.0034)	0.0379*** (0.0031)	0.0338*** (0.0028)	0.0658*** (0.0042)
	Observations	751,170	751,170	751,170	133,817
Soaps	Coefficient (Std.)	0.057*** (0.0053)	0.0424*** (0.0045)	0.0347*** (0.0042)	0.0563*** (0.0058)
	Observations	323,840	323,840	323,840	93,074
Soft Drinks	Coefficient (Std.)	0.027*** (0.0012)	0.0255*** (0.0011)	0.0212*** (0.001)	0.0608*** (0.0029)
	Observations	3,748,192	3,748,192	3,748,192	301,273
Toothbrushes	Coefficient (Std.)	0.029*** (0.0032)	0.0322*** (0.0033)	0.0269*** (0.0031)	0.062*** (0.0064)
	Observations	275,080	275,080	275,080	41,256
Toothpastes	Coefficient (Std.)	0.0286*** (0.0032)	0.0277*** (0.0027)	0.0238*** (0.0026)	0.0581*** (0.0064)
	Observations	570,338	570,338	570,338	86,903
Average coefficients		**0.036**	**0.029**	**0.025**	**0.045**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change, using observations on national brand products. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product i in store s over the sample period. Column 1 reports the results of baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices, which we identify using a sales filter algorithm, and the competition zone of the store. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table M2. Category-level regressions of small price changes volume, using observations on private label products

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0295*** (0.0079)	0.0137** (0.0049)	0.0064 (0.0046)	0.0266* (0.0137)
	Observations	31,617	31,617	31,617	11,090
Bath Soap	Coefficient (Std.)	0.0096*** (0.0007)	0.0065 (0.0056)	0.0072 (0.0064)	
	Observations	4,957	4,957	4,957	
Bathroom Tissues	Coefficient (Std.)	0.0553*** (0.0066)	0.0056 (0.0134)	0.0031 (0.0114)	0.0035 (0.0158)
	Observations	18,943	18,943	18,943	6,664
Beer	Coefficient (Std.)				
	Observations				
Bottled Juice	Coefficient (Std.)	0.0486*** (0.0053)	0.0438*** (0.0051)	0.0355*** (0.0053)	0.0545*** (0.0099)
	Observations	119,432	119,432	119,432	31,569
Canned Soup	Coefficient (Std.)	0.0256* (0.0135)	0.0082 (0.008)	0.0082 (0.0078)	0.015 (0.0091)
	Observations	55,997	55,997	55,997	17,732
Canned Tuna	Coefficient (Std.)	0.0776*** (0.0104)	0.0449*** (0.0104)	0.0397*** (0.0113)	0.0474*** (0.0086)
	Observations	14,748	14,748	14,748	4,410
Cereals	Coefficient (Std.)	0.0047 (0.0077)	0.0009 (0.0085)	-0.0109 (0.0102)	0.0491*** (0.0099)
	Observations	81,201	81,201	81,201	15,169
Cheese	Coefficient (Std.)	0.0286*** (0.0066)	0.0146** (0.0059)	0.0077 (0.0056)	0.013* (0.0075)
	Observations	414,036	414,036	414,036	64,391
Cigarettes	Coefficient (Std.)				
	Observations				
Cookies	Coefficient (Std.)	0.0462*** (0.005)	0.0374*** (0.0047)	0.0299*** (0.0044)	0.0504*** (0.0113)
	Observations	177,701	177,701	177,701	25,616
Crackers	Coefficient (Std.)	0.0462*** (0.0051)	0.0423** (0.0075)	0.034** (0.0086)	0.054** (0.013)
	Observations	32,249	32,249	32,249	5,487
Dish Detergent	Coefficient (Std.)	0.0626*** (0.0077)	0.0575*** (0.007)	0.056*** (0.0078)	0.0647*** (0.0099)
	Observations	45,246	45,246	45,246	9,101
Fabric Softener	Coefficient (Std.)	0.0641*** (0.0095)	0.0545*** (0.0095)	0.0465*** (0.01)	0.0703*** (0.0098)
	Observations	42,022	42,022	42,022	10,860
Front-End-Candies	Coefficient (Std.)				
	Observations				
Frozen Dinners	Coefficient (Std.)				
	Observations				

Table M2. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0395*** (0.0075)	0.0445*** (0.0075)	0.0348*** (0.0064)	0.0725*** (0.0188)
	Observations	8,736	8,736	8,736	1,560
Frozen Juices	Coefficient (Std.)	0.0421*** (0.0076)	0.0365*** (0.0066)	0.0342*** (0.0065)	0.0337* (0.0164)
	Observations	118,148	118,148	118,148	21,915
Grooming Products	Coefficient (Std.)	0.0474*** (0.0107)	0.0479** (0.0098)	0.0398*** (0.0073)	0.081** (0.0311)
	Observations	17,603	17,603	17,603	2,941
Laundry Detergents	Coefficient (Std.)	0.0686** (0.0299)	0.0659** (0.029)	0.0611** (0.0272)	0.0707*** (0.0248)
	Observations	21,609	21,609	21,609	4,988
Oatmeal	Coefficient (Std.)	0.0219** (0.0084)	0.009 (0.0095)	0.0053 (0.0087)	0.0635** (0.0259)
	Observations	21,372	21,372	21,372	3,423
Paper Towels	Coefficient (Std.)	0.0187* (0.0252)	0.0373** (0.0122)	0.034** (0.0091)	0.0504** (0.0104)
	Observations	18,978	18,978	18,978	3,777
Refrigerated Juices	Coefficient (Std.)	0.0248** (0.011)	0.0188 (0.0115)	0.0128 (0.0115)	0.0417*** (0.0129)
	Observations	83,832	83,832	83,832	14,074
Shampoos	Coefficient (Std.)	0.0023 (0.0233)	0.0078 (0.026)	0.0063 (0.0215)	
	Observations	1,319	1,319	1,319	
Snack Crackers	Coefficient (Std.)	0.0525*** (0.0068)	0.0407*** (0.0057)	0.0302*** (0.0052)	0.0688*** (0.0145)
	Observations	49,987	49,987	49,987	9,251
Soaps	Coefficient (Std.)				
	Observations				
Soft Drinks	Coefficient (Std.)	0.0568*** (0.0075)	0.0231*** (0.0046)	0.0204*** (0.0041)	0.0324*** (0.0085)
	Observations	511,920	511,920	511,920	38,424
Toothbrushes	Coefficient (Std.)	-0.0029 (0.0125)	-0.0034 (0.013)	-0.0086 (0.0121)	0.0425 (0.0323)
	Observations	11,756	11,756	11,756	1,876
Toothpastes	Coefficient (Std.)	0.0735** (0.02)	0.0533** (0.016)	0.0388* (0.016)	0.0235 (0.0394)
	Observations	8,565	8,565	8,565	2,363
Average coefficients		**0.039**	**0.030**	**0.024**	**0.047**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change, using observations on private label products. We drop categories if we do not have at least 500 observations on private label products. The dependent variable is “small price change,” which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices, which we identify using a sales filter algorithm, and the competition zone of the store. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table M3. Category-level regressions of small price changes and sales volume, using observations on national brand products, prices that survived for 2 weeks

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0166*** (0.0045)	0.0116*** (0.0043)	0.0114*** (0.0043)	0.0077*** (0.0087)
	Observations	67,651	67,651	67,651	20,850
Bath Soap	Coefficient (Std.)	0.0129 (0.0146)	0.0063 (0.0148)	0.0059*** (0.0143)	-0.0203*** (0.0279)
	Observations	5,805	5,805	5,805	1,366
Bathroom Tissues	Coefficient (Std.)	0.0537*** (0.0097)	0.0176** (0.0093)	0.0174*** (0.0092)	0.0333*** (0.0111)
	Observations	52,445	52,445	52,445	17,009
Beer	Coefficient (Std.)	0.002*** (0.0006)	0.0043*** (0.0007)	0.0043*** (0.0007)	0.018*** (0.0055)
	Observations	187,691	187,691	187,691	12,080
Bottled Juice	Coefficient (Std.)	0.0367*** (0.0086)	0.0176*** (0.0074)	0.0172*** (0.0075)	0.0308*** (0.0093)
	Observations	198,936	198,936	198,936	53,339
Canned Soup	Coefficient (Std.)	0.0005 (0.0099)	-0.006 (0.0096)	-0.0031*** (0.0093)	0.0137*** (0.008)
	Observations	219,520	219,520	219,520	89,102
Canned Tuna	Coefficient (Std.)	0.0054 (0.0064)	-0.0036 (0.0057)	-0.0038*** (0.0056)	0.0089*** (0.0082)
	Observations	108,716	108,716	108,716	30,428
Cereals	Coefficient (Std.)	0.0111* (0.0064)	0.0118** (0.006)	0.0117*** (0.006)	0.0237*** (0.0072)
	Observations	123,336	123,336	123,336	69,327
Cheese	Coefficient (Std.)	0.0085* (0.0044)	0.0041* (0.0036)	0.0038*** (0.0036)	0.0143*** (0.0049)
	Observations	291,896	291,896	291,896	80,488
Cigarettes	Coefficient (Std.)	0.0044 (0.0051)	0.0021 (0.0049)	0.0022*** (0.0048)	0*** (0.0055)
	Observations	24,553	24,553	24,553	20,692
Cookies	Coefficient (Std.)	0.0069*** (0.0018)	0.0056*** (0.0019)	0.0055*** (0.0019)	0.0048*** (0.0037)
	Observations	296,041	296,041	296,041	61,344
Crackers	Coefficient (Std.)	0.0006 (0.0034)	0 (0.0032)	0.0003*** (0.0032)	0.0101*** (0.0069)
	Observations	110,219	110,219	110,219	23,427
Dish Detergent	Coefficient (Std.)	0.0354*** (0.0074)	0.0297*** (0.0066)	0.0297*** (0.0065)	0.029*** (0.0056)
	Observations	72,857	72,857	72,857	24,354
Fabric Softener	Coefficient (Std.)	0.0177** (0.0074)	0.0031 (0.0061)	0.0036*** (0.006)	0.0278*** (0.0081)
	Observations	75,811	75,811	75,811	24,518
Front-End-Candies	Coefficient (Std.)	0.01** (0.0041)	-0.003* (0.0033)	-0.0028*** (0.0033)	0.0017*** (0.003)
	Observations	148,200	148,200	148,200	77,323
Frozen Dinners	Coefficient (Std.)	0.0512*** (0.0069)	0.0389*** (0.0062)	0.0406*** (0.0062)	0.0758*** (0.0105)
	Observations	52,893	52,893	52,893	12,287

Table M3. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0222*** (0.0026)	0.0163*** (0.0026)	0.0165*** (0.0026)	0.0225*** (0.0039)
	Observations	343,898	343,898	343,898	116,594
Frozen Juices	Coefficient (Std.)	0.0144* (0.0077)	0.0108** (0.0072)	0.0123*** (0.007)	0.0239*** (0.009)
	Observations	102,582	102,582	102,582	34,179
Grooming Products	Coefficient (Std.)	0.0097*** (0.0034)	0.0114*** (0.0033)	0.0116*** (0.0033)	0.0139*** (0.0115)
	Observations	99,243	99,243	99,243	21,209
Laundry Detergents	Coefficient (Std.)	0.02*** (0.0044)	0.0119*** (0.0036)	0.0121*** (0.0036)	0.0181*** (0.0058)
	Observations	116,100	116,100	116,100	40,837
Oatmeal	Coefficient (Std.)	0.0111 (0.0128)	0.0046 (0.0126)	0.0025*** (0.0118)	0.0556*** (0.0114)
	Observations	23,181	23,181	23,181	13,112
Paper Towels	Coefficient (Std.)	0.028* (0.0163)	0.0148 (0.0179)	0.016*** (0.0178)	0.0202*** (0.0155)
	Observations	46,637	46,637	46,637	8,730
Refrigerated Juices	Coefficient (Std.)	0.0181** (0.0082)	0.0113** (0.0084)	0.0111*** (0.0082)	0.0222*** (0.0122)
	Observations	99,777	99,777	99,777	21,665
Shampoos	Coefficient (Std.)	0.0102*** (0.0025)	0.0107*** (0.0025)	0.0107*** (0.0025)	0.0234*** (0.008)
	Observations	87,969	87,969	87,969	16,041
Snack Crackers	Coefficient (Std.)	0.0025 (0.0028)	0.0042** (0.0028)	0.0042*** (0.0028)	0.021*** (0.005)
	Observations	168,620	168,620	168,620	35,998
Soaps	Coefficient (Std.)	0.0263*** (0.0088)	0.0139** (0.008)	0.0173*** (0.008)	0.0516*** (0.0117)
	Observations	56,710	56,710	56,710	16,872
Soft Drinks	Coefficient (Std.)	0.0095*** (0.002)	0.0079*** (0.0019)	0.0071*** (0.0019)	0.0121*** (0.004)
	Observations	183,882	183,882	183,882	39,371
Toothbrushes	Coefficient (Std.)	0.0135*** (0.0048)	0.0102*** (0.0049)	0.0097*** (0.0048)	0.0182*** (0.0102)
	Observations	49,837	49,837	49,837	12,879
Toothpastes	Coefficient (Std.)	0.001 (0.004)	0.0002 (0.0039)	0.0003*** (0.0039)	0.0057*** (0.0083)
	Observations	99,045	99,045	99,045	27,348
Average coefficients		**0.0159**	**0.0093**	**0.0095**	**0.0203**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change, using observations on national brand products. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices, which we identify using a sales filter algorithm, and the competition zone of the store. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table M4. Category-level regressions of small price changes and sales volume, using observations on private label products, prices that survived for 2 weeks

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0203*** (0.0111)	0.019*** (0.0107)	0.0182*** (0.0112)	0.0382*** (0.0162)
	Observations	6,800	6,800	6,800	3,879
Bath Soap	Coefficient (Std.)				
	Observations				
Bathroom Tissues	Coefficient (Std.)	0.0794*** (0.0263)	-0.0113*** (0.0209)	-0.0113*** (0.0189)	-0.0176*** (0.0067)
	Observations	4,013	4,013	4,013	2,276
Beer	Coefficient (Std.)				
	Observations				
Bottled Juice	Coefficient (Std.)	0.0154*** (0.012)	0.0228*** (0.0117)	0.0308*** (0.0119)	0.0986*** (0.0282)
	Observations	25,921	25,921	25,921	6,676
Canned Soup	Coefficient (Std.)	0.0013*** (0.0169)	-0.0041*** (0.0133)	-0.0002*** (0.0131)	0.0048*** (0.0178)
	Observations	14,259	14,259	14,259	6,208
Canned Tuna	Coefficient (Std.)	0.137*** (0.033)	0.1061*** (0.0256)	0.1066*** (0.0258)	0.1109*** (0.0336)
	Observations	3,913	3,913	3,913	1,494
Cereals	Coefficient (Std.)	-0.0686*** (0.0265)	-0.0732*** (0.0244)	-0.0814*** (0.0273)	0.0235*** (0.0349)
	Observations	17,751	17,751	17,751	3,462
Cheese	Coefficient (Std.)	0.0115*** (0.0081)	0.009*** (0.008)	0.0082*** (0.0079)	-0.0307*** (0.0134)
	Observations	65,783	65,783	65,783	12,270
Cigarettes	Coefficient (Std.)				
	Observations				
Cookies	Coefficient (Std.)	0.0387*** (0.0127)	0.0355*** (0.0128)	0.0376*** (0.0127)	0.0503*** (0.0176)
	Observations	21,891	21,891	21,891	4,743
Crackers	Coefficient (Std.)	-0.0006*** (0.0061)	-0.0007*** (0.0056)	-0.0006*** (0.006)	-0.0082*** (0.0284)
	Observations	5,439	5,439	5,439	1,344
Dish Detergent	Coefficient (Std.)	0.0023*** (0.0175)	0.0085*** (0.0161)	0.012*** (0.016)	-0.0118*** (0.0269)
	Observations	12,365	12,365	12,365	2,381
Fabric Softener	Coefficient (Std.)	-0.005*** (0.0071)	-0.0079*** (0.0062)	-0.0075*** (0.0059)	0.0126*** (0.0249)
	Observations	9,526	9,526	9,526	2,970
Front-End-Candies	Coefficient (Std.)				
	Observations				
Frozen Dinners	Coefficient (Std.)				
	Observations				

Table M4. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0461*** (0.0236)	0.0467*** (0.024)	0.0397*** (0.0211)	0.0328*** (0.0334)
	Observations	1,325	1,325	1,325	450
Frozen Juices	Coefficient (Std.)	0.0025*** (0.0202)	-0.0032*** (0.0181)	-0.0033*** (0.0176)	0.0375*** (0.0199)
	Observations	16,000	16,000	16,000	6,338
Grooming Products	Coefficient (Std.)	0.0262*** (0.0086)	0.027*** (0.0076)	0.0276*** (0.0077)	0.0849*** (0.0298)
	Observations	2,701	2,701	2,701	893
Laundry Detergents	Coefficient (Std.)	0.0814*** (0.066)	0.069*** (0.0601)	0.0674*** (0.0555)	0.0153*** (0.0245)
	Observations	5,466	5,466	5,466	1,284
Oatmeal	Coefficient (Std.)	0.0819*** (0.0732)	0.0648*** (0.0573)	0.0636*** (0.0595)	-0.0051*** (0.0532)
	Observations	2,342	2,342	2,342	493
Paper Towels	Coefficient (Std.)	0.1087*** (0.0483)	0.0922*** (0.0523)	0.0834*** (0.0476)	0.069*** (0.0399)
	Observations	1,562	1,562	1,562	513
Refrigerated Juices	Coefficient (Std.)	-0.0393*** (0.0266)	-0.0583*** (0.0232)	-0.06*** (0.0224)	-0.0653*** (0.0435)
	Observations	9,188	9,188	9,188	2,040
Shampoos	Coefficient (Std.)	-0.2464*** (0.1073)	-0.1186*** (0.1087)	-0.1181*** (0.1089)	0*** (0)
	Observations	224	224	224	58
Snack Crackers	Coefficient (Std.)	-0.0036*** (0.0136)	-0.0088*** (0.013)	-0.01*** (0.013)	-0.0395*** (0.0204)
	Observations	7,907	7,907	7,907	2125
Soaps	Coefficient (Std.)				
	Observations				
Soft Drinks	Coefficient (Std.)	0.0765*** (0.0181)	0.0082*** (0.006)	0.0081*** (0.0058)	0.0035*** (0.0064)
	Observations	59,955	59,955	59,955	10,618
Toothbrushes	Coefficient (Std.)	-0.0185*** (0.0133)	-0.0205*** (0.0132)	-0.0215*** (0.0129)	-0.07*** (0.0368)
	Observations	2,348	2,348	2,348	816
Toothpastes	Coefficient (Std.)	-0.0576*** (0.0472)	-0.0386*** (0.0342)	-0.0364*** (0.0335)	-0.0096*** (0.051)
	Observations	1,800	1,800	1,800	691
Average coefficients		**0.0126**	**0.0071**	**0.0066**	**0.0141**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change, using observations on national brand products. We drop categories if we do not have at least 500 observations on private-label products. The dependent variable is “small price change,” which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices, which we identify using a sales filter algorithm, and the competition zone of the store. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix N. Sales volumes, small price changes, and holidays

Levy et al. (2010) argue that menu costs are higher during the holiday season than at other times. As they note, store traffic is higher during holidays than other times and, consequently, tasks such as restocking shelves, running cash registers, cleaning and bagging, etc., become more urgent. Therefore, the opportunity cost of price adjustment increases during holiday periods.

If menu costs are higher, then we should observe fewer small price changes, possibly weakening the correlation between sales volumes and small price changes. To explore this, we focus on the holiday period, which, following Warner and Barsky (1995) and Levy et al. (2010), we define as the period starting the week before Thanksgiving through the week of Christmas, a total of six weeks.

Table N1 presents the results of regressions equivalent to the regressions in Table 3 in the paper. This time, however, we use only observations on the holiday period, defined as above. The regressions take the following form:

$$\begin{aligned} small\ price\ change_{i,s,t} &= \alpha + \beta \ln(average\ sales\ volume_{i,s}) + \gamma \mathbf{X}_{i,s,t} \\ &+ month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \end{aligned} \quad \text{(N1)}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product.

As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t* + 1 and the post change price remained unchanged for at least 2 weeks. The values in Table N1 are the coefficients of the log of the average sales volume when we use the sample of national brands. In column 1, the control variables are the log of the average sales volume, and the dummies for months, years, stores, and products. We find that 19 out of the 29 coefficients of the log of the average sales volume are positive. Out of the 19 positive coefficients, 4 are statistically significant and 5 are marginally statistically significant. Out of the 10 negative coefficients, 3 are statistically significant and 4 more are marginally significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). 20 of the 29 coefficients are positive. 5 of the positive coefficients are statistically significant and 4 are marginally significant. Out of the 9 negative coefficients, 3 are statistically significant, and 2 more are marginally significant. The average coefficient is 0.005, suggesting that a 1% increase in the sales volume is associated with a 0.5% increase in the likelihood of a small price change.

In column 3, we add a control for 9-ending prices. We find that 19 out of the 29 coefficients of the log of the average sales volume are positive. Out of the 19 positive coefficients, 5 are statistically significant and 3 are marginally statistically significant. Out of the 10 negative coefficients, 3 are statistically significant, and 2 more are marginally significant. The average coefficient is 0.006, suggesting that a 1% increase in the sales volume is associated with a 0.6% increase in the likelihood of a small price change.

As a further control for the possible effects of sales on the results we report, in column 4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, 18 of the 29 coefficients are positive. 7 of them are statistically significant, and 2 more are marginally significant. Out of the 11 negative coefficients, 3 are statistically significant, and 2 more are marginally significant. The average coefficient is 0.008, suggesting that a 1% increase in the sales volume is associated with a 0.8% increase in the likelihood of a small price change.

We thus find that the positive correlation between sales volumes and small price changes seems to be weaker during the holiday periods, which is consistent with a high cost of price changes during holidays (Levy et al. 2010). However, because the number of observations is relatively small, these results require further research.

Table N1. Category-level regressions of small price changes using observations on products sold in the Thanksgiving-Christmas holiday period

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient	0.0211**	0.0156**	0.0161***	0.0352***
	(Std.)	(0.0112)	(0.0105)	(0.0105)	(0.0171)
	Observations	8,769	8,769	8,769	2,982
Bath Soap	Coefficient	-0.001	0.0136*	0.0106***	0.0402
	(Std.)	(0.0144)	(0.0151)	(0.0164)	(0.1183)
	Observations	622	622	622	116
Bathroom Tissues	Coefficient	0.0555***	0.0007	0.0127***	0.0078
	(Std.)	(0.0224)	(0.0185)	(0.0177)	(0.0259)
	Observations	6,334	6,334	6,334	1,685
Beer	Coefficient	-0.0005*	0.0007*	0.0007***	0.0116*
	(Std.)	(0.0006)	(0.0005)	(0.0005)	(0.0109)
	Observations	16,773	16,773	16,773	669
Bottled Juice	Coefficient	0.0111*	0.0042	0.0038***	-0.001
	(Std.)	(0.0099)	(0.0096)	(0.0097)	(0.0134)
	Observations	26,881	26,881	26,881	9,610
Canned Soup	Coefficient	-0.0123*	-0.0158**	-0.0169***	0.0097
	(Std.)	(0.0104)	(0.0103)	(0.0098)	(0.0123)
	Observations	28,293	28,293	28,293	8,944
Canned Tuna	Coefficient	0.0006	-0.0034	-0.0047***	0
	(Std.)	(0.0103)	(0.0103)	(0.0103)	(0.0126)
	Observations	12,860	12,860	12,860	3,436
Cereals	Coefficient	0.0204**	0.0175*	0.0179***	0.0226**
	(Std.)	(0.0148)	(0.0139)	(0.0139)	(0.013)
	Observations	15,947	15,947	15,947	10,547
Cheese	Coefficient	0.0065*	0.002	0.0019***	0.0016
	(Std.)	(0.007)	(0.0065)	(0.0065)	(0.0099)
	Observations	42,339	42,339	42,339	10,048
Cigarettes	Coefficient	-0.0132*	-0.0101*	-0.0101***	-0.0096*
	(Std.)	(0.0128)	(0.0097)	(0.0096)	(0.0095)
	Observations	2,403	2,403	2,403	2,241
Cookies	Coefficient	0.0035	0.0029	0.0022***	-0.0018
	(Std.)	(0.0051)	(0.005)	(0.0048)	(0.0071)
	Observations	21,508	21,508	21,508	7,429
Crackers	Coefficient	0.0048*	0.0032	0.0041***	-0.008*
	(Std.)	(0.0052)	(0.0054)	(0.0055)	(0.0088)
	Observations	7,263	7,263	7,263	1,861
Dish Detergent	Coefficient	0.0376***	0.0308***	0.0325***	0.0089**
	(Std.)	(0.009)	(0.0084)	(0.0082)	(0.0061)
	Observations	10,342	10,342	10,342	3,385
Fabric Softener	Coefficient	0.008	-0.0117	-0.0112***	-0.0135
	(Std.)	(0.0182)	(0.0148)	(0.0149)	(0.0171)
	Observations	8,121	8,121	8,121	3,373
Front-End-Candies	Coefficient	-0.0121**	-0.0113***	-0.0069***	-0.0031
	(Std.)	(0.0085)	(0.0045)	(0.0045)	(0.0038)
	Observations	15,148	15,148	15,148	6,289
Frozen Dinners	Coefficient	0.0132*	0.0056	0.0038***	0.0099**
	(Std.)	(0.014)	(0.0142)	(0.014)	(0.0089)
	Observations	3,534	3,534	3,534	596

Table N1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0069* (0.0068)	-0.0052 (0.0078)	-0.0055*** (0.0076)	-0.0042 (0.0096)
	Observations	21,998	21,998	21,998	9,784
Frozen Juices	Coefficient (Std.)	-0.0021 (0.0134)	0.0003 (0.015)	-0.0027*** (0.0144)	0.0017 (0.0231)
	Observations	13,388	13,388	13,388	4,499
Grooming Products	Coefficient (Std.)	0.0041 (0.008)	0.0068 (0.0087)	0.0067*** (0.0085)	0.0083 (0.0161)
	Observations	9,078	9,078	9,078	2,327
Laundry Detergents	Coefficient (Std.)	0.0186** (0.0124)	0.0136* (0.0107)	0.0137*** (0.0107)	0.0194** (0.0118)
	Observations	13,130	13,130	13,130	5,979
Oatmeal	Coefficient (Std.)	0.0219** (0.0237)	0.0104 (0.0195)	0.0106*** (0.0191)	0.0787*** (0.0311)
	Observations	2,854	2,854	2,854	1,082
Paper Towels	Coefficient (Std.)	0.0636** (0.037)	0.0578** (0.0359)	0.0581*** (0.0361)	0.0614** (0.038)
	Observations	5,633	5,633	5,633	1,284
Refrigerated Juices	Coefficient (Std.)	0.0026 (0.0143)	0.0027 (0.014)	0.0025*** (0.0138)	0.0259** (0.0184)
	Observations	15,643	15,643	15,643	4,026
Shampoos	Coefficient (Std.)	-0.0042** (0.0029)	0.0009 (0.0031)	0.0009*** (0.0031)	0.0074 (0.011)
	Observations	8,669	8,669	8,669	884
Snack Crackers	Coefficient (Std.)	-0.0053* (0.0046)	-0.0054** (0.005)	-0.0047*** (0.0049)	-0.0022 (0.004)
	Observations	20,929	20,929	20,929	4,015
Soaps	Coefficient (Std.)	0.0422*** (0.0171)	0.0371 (0.0171)	0.042*** (0.0159)	0.0051 (0.0289)
	Observations	4,592	4,592	4,592	1,032
Soft Drinks	Coefficient (Std.)	0.0261*** (0.0072)	0.008** (0.0045)	0.0106*** (0.005)	-0.0233*** (0.0078)
	Observations	31,935	31,935	31,935	5,062
Toothbrushes	Coefficient (Std.)	-0.0023 (0.0105)	-0.0028*** (0.0101)	-0.0042*** (0.0107)	-0.0199** (0.0142)
	Observations	6,748	6,748	6,748	2,056
Toothpastes	Coefficient (Std.)	-0.0307*** (0.0086)	-0.0227*** (0.0081)	-0.0216*** (0.0079)	-0.0386*** (0.0129)
	Observations	12,819	12,819	12,819	5,182
Average coefficients		**0.0098**	**0.0050**	**0.0056**	**0.0079**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change, using observations on products sold during the holiday period. We define the holiday period as starting in the week prior to Thanksgiving and continuing through Christmas. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of baseline regression that includes only the log of the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices, which we identify using a sales filter algorithm and the competition zone of the store. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices.

We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix O. The likelihood of a price change, irrespective of its size

In the paper, we show that in Barro's (1972) menu cost model, an increase in the sales volume reduces the width of the *S*-*s* band, leading to (a) more frequent small price changes, and (b) more frequent price changes (of any size). In the paper, we report evidence supporting the first prediction. In this appendix, we show that the data supports the second prediction as well.

As a first test, we look within categories. Table O1 presents the results of regressions equivalent to the regressions in Table 3 in the paper. The regressions take the form:

$$price\ change_{i,s,t} = \alpha + \beta\ ln(\ average\ sales\ volume_{i,s}) + \gamma \boldsymbol{X}_{i,s,t} \\ + month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \qquad \text{(O1)}$$

where *price change* is a dummy that equals 1 if the price of product *i* in store *s* changed at time *t*, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product. As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t* + 1 and the post change price remained unchanged for at least 2 weeks.

The values in the table are the coefficients of the log of the average sales volume. In column 1, the control variables are the log of the average sales volume, and dummies for months, years, stores, and products. We find that 24 of the 29 coefficients of the average sales volume are positive. 20 of the 24 positive coefficients are statistically significant. The 5 negative coefficients are also statistically significant. The average coefficient is 0.004, suggesting that a 1% increase in the average sales volume is associated with a 0.4% increase in the likelihood of a price change.

In column 2, we add controls for the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using the sales filter algorithm of Fox and Syed (2016). We find that 24 of the 29 coefficients of the average sales volume are positive. 21 of the 24 positive coefficients are statistically significant. 3 out of the 5 negative coefficients are statistically significant. The average coefficient is 0.005, suggesting that a 1% increase in the average sales volume is associated with a 0.5% increase in the likelihood of a price change.

In column 3, we add a control for 9-ending prices. 24 of the 29 coefficients of the average sales volume are positive. 21 of the 24 positive coefficients are statistically significant. 3 out of the 5 negative coefficients are statistically significant. The average coefficient is 0.005, suggesting that a 1% increase in the average sales volume is associated with a 0.5% increase in the likelihood of a price change.

As a further control for the effects of sales on the results, in column 4 we focus on regular prices by excluding all sale and bounce-back prices. 27 of the 29 coefficients are positive. 25 of the positive coefficients are statistically significant, and 1 more is marginally statistically significant. The average coefficient is 0.002, suggesting that a 1% increase in the sales volume is associated with a 0.2% increase in the likelihood of a price change.

As a second test, we conduct a product-level test, similar to the test that its results are reported in Table 4 in the paper. To conduct the test, we calculate for each product in each of the 29 product categories the average weekly sales volume and the share of small price changes in each store it was offered. Many products in the sample were offered for only short periods of time, or only in a small number of stores. To avoid biases, we drop products for which we do not have information for at least 30 stores.

Using these data, we estimate for each product in each category, an OLS regression with robust standard errors. The dependent variable is the share of price changes out of all observations for the product in each store. The independent variable is the average sales volume of the product in each store. The estimation results are reported in Table O2.

Column 1 presents for each product category, the average of the estimated coefficients. Column 2 presents the total number of coefficients. Column 3 presents the percentage of the positive coefficients. Column 4 presents the number of statistically significant coefficients. Column 5 presents the percentage of positive and significant coefficients out of the total number of statistically significant coefficients.

According to the figures in the table, the average coefficients are positive for all 29 product categories. Further, the number of positive coefficients far exceeds the number of negative coefficients: On average, 83.4% of all the coefficients are positive.

Focusing on statistically significant coefficients, we find a far greater number of positive coefficients than negative coefficients. On average, 90.5% of all statistically significant coefficients are positive. In other words, for the overwhelming majority of the individual products in our sample, we find a positive relationship between sales volume and the likelihood of a price change.

In summary, we find that as predicted by Barro’s (1972) model, an increase in the sales volume is associated with an increase in the likelihood of a price change, in addition to an increase in the likelihood of a small price change.

Table O1. The likelihood of a price change

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0095*** (0.0006)	0.0102*** (0.0007)	0.0103*** (0.0007)	0.004*** (0.0003)
	Observations	3,060,156	3,019,519	3,019,519	2,615,923
Bath Soap	Coefficient (Std.)	0.0097*** (0.0008)	0.0103*** (0.0009)	0.0102*** (0.0009)	0.0037*** (0.0004)
	Observations	418,097	402,960	402,960	336,180
Bathroom Tissues	Coefficient (Std.)	-0.0032*** (0.0008)	-0.0026*** (0.0008)	-0.0026*** (0.0008)	0.0002*** (0.0004)
	Observations	1,159,016	1,149,177	1,149,177	831,301
Beer	Coefficient (Std.)	0.0307*** (0.0016)	0.0273*** (0.0014)	0.0293*** (0.0014)	0.002*** (0.0003)
	Observations	1,970,266	1,940,556	1,940,556	1,174,512
Bottled Juice	Coefficient (Std.)	-0.0024*** (0.0007)	0.0005*** (0.0007)	0.0006*** (0.0007)	0.0008*** (0.0003)
	Observations	4,325,024	4,288,625	4,288,625	3,205,484
Canned Soup	Coefficient (Std.)	0.0017*** (0.0006)	0.0026*** (0.0006)	0.0025*** (0.0006)	0.0012*** (0.0003)
	Observations	5,551,684	5,518,976	5,518,976	4,539,808
Canned Tuna	Coefficient (Std.)	0.0032*** (0.0009)	0.0052*** (0.001)	0.0053*** (0.001)	0.0026*** (0.0004)
	Observations	2,403,558	2,383,604	2,383,604	1,875,309
Cereals	Coefficient (Std.)	-0.001*** (0.0003)	-0.0014*** (0.0003)	-0.0014*** (0.0003)	-0.0003*** (0.0002)
	Observations	4,751,202	4,714,708	4,714,708	4,127,993
Cheese	Coefficient (Std.)	0.0013*** (0.0005)	0.0029*** (0.0005)	0.0032*** (0.0005)	0.0011*** (0.0003)
	Observations	6,810,625	6,763,438	6,763,438	4,961,570
Cigarettes	Coefficient (Std.)	0.0069*** (0.0003)	0.0068*** (0.0003)	0.0068*** (0.0003)	0.0061*** (0.0003)
	Observations	1,810,615	1,774,701	1,774,701	1,742,604
Cookies	Coefficient (Std.)	0.004*** (0.0004)	0.0055*** (0.0004)	0.0057*** (0.0004)	0.0022*** (0.0002)
	Observations	7,635,071	7,556,886	7,556,886	5,821,862
Crackers	Coefficient (Std.)	0.0103*** (0.0011)	0.0128*** (0.0012)	0.013*** (0.0012)	0.0044*** (0.0004)
	Observations	2,245,703	2,224,614	2,224,614	1,588,598
Dish Detergent	Coefficient (Std.)	0.0034*** (0.0007)	0.0042*** (0.0007)	0.0042*** (0.0007)	0.0019*** (0.0003)
	Observations	2,183,582	2,161,641	2,161,641	1,744,461
Fabric Softener	Coefficient (Std.)	0.0021*** (0.0005)	0.0032*** (0.0007)	0.0032*** (0.0006)	0.0018*** (0.0003)
	Observations	2,296,612	2,271,465	2,271,465	1,877,718
Front-End-Candies	Coefficient (Std.)	0.0022*** (0.0003)	0.0039*** (0.0004)	0.0039*** (0.0004)	0.0033*** (0.0003)
	Observations	4,475,750	4,441,325	4,441,325	3,948,230
Frozen Dinners	Coefficient (Std.)	0.0005*** (0.0007)	0.0028*** (0.0007)	0.0027*** (0.0007)	0.0027*** (0.0004)
	Observations	1,654,053	1,634,182	1,634,182	1,061,943

Table O1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0025*** (0.0004)	0.0068*** (0.0005)	0.0068*** (0.0005)	0.0044*** (0.0003)
	Observations	7,232,080	7,164,744	7,164,744	5,163,065
Frozen Juices	Coefficient (Std.)	-0.002*** (0.0008)	-0.0004*** (0.0007)	-0.0004*** (0.0007)	0.001*** (0.0005)
	Observations	2,387,420	2,373,678	2,373,678	1,700,508
Grooming Products	Coefficient (Std.)	0.011*** (0.0005)	0.0107*** (0.0005)	0.0109*** (0.0005)	0.003*** (0.0002)
	Observations	4,065,694	3,980,757	3,980,757	2,937,437
Laundry Detergents	Coefficient (Std.)	0.0023*** (0.0005)	0.0035*** (0.0006)	0.0036*** (0.0006)	0.0017*** (0.0003)
	Observations	3,303,174	3,258,164	3,258,164	2,616,474
Oatmeal	Coefficient (Std.)	0.0008*** (0.0009)	0.0012*** (0.0012)	0.0012*** (0.0012)	0.0013*** (0.0007)
	Observations	981,263	973,819	973,819	839,966
Paper Towels	Coefficient (Std.)	0.0006*** (0.001)	0*** (0.001)	0*** (0.001)	0*** (0.0005)
	Observations	948,871	937,197	937,197	672,784
Refrigerated Juices	Coefficient (Std.)	-0.0025*** (0.0007)	-0.0019*** (0.0007)	-0.0015*** (0.0007)	0.0008*** (0.0004)
	Observations	2,182,989	2,165,804	2,165,804	1,363,980
Shampoos	Coefficient (Std.)	0.0095*** (0.0003)	0.0092*** (0.0003)	0.0094*** (0.0003)	0.0026*** (0.0001)
	Observations	4,676,790	4,535,601	4,535,601	3,330,183
Snack Crackers	Coefficient (Std.)	0.0046*** (0.0006)	0.0058*** (0.0007)	0.006*** (0.0007)	0.0017*** (0.0003)
	Observations	3,515,192	3,484,645	3,484,645	2,501,842
Soaps	Coefficient (Std.)	0.0005*** (0.0005)	0.0009*** (0.0006)	0.0009*** (0.0006)	0.0013*** (0.0003)
	Observations	1,835,196	1,810,103	1,810,103	1,464,608
Soft Drinks	Coefficient (Std.)	0.0019*** (0.0002)	0.0021*** (0.0002)	0.0024*** (0.0002)	0.0013*** (0.0002)
	Observations	10,807,191	10,702,594	10,702,594	5,499,044
Toothbrushes	Coefficient (Std.)	0.0107*** (0.0006)	0.011*** (0.0007)	0.0111*** (0.0007)	0.0049*** (0.0004)
	Observations	1,854,983	1,825,943	1,825,943	1,354,698
Toothpastes	Coefficient (Std.)	0.007*** (0.0005)	0.0072*** (0.0006)	0.0073*** (0.0006)	0.0031*** (0.0003)
	Observations	3,003,392	2,964,185	2,964,185	2,234,909
Average coefficients		**0.0043**	**0.0052**	**0.0053**	**0.0022**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a price change. The dependent variable is "price change," of product *i* in store *s* at time *t* which equals 1 if a price of product *i* in store *s* changes at time *t* and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table O2. Product-level regressions of the % of small price changes and sales volume by categories, including controls

Product Category	Average coefficient (1)	No. of coefficients (2)	% positive coefficients (3)	No. of significant coefficients (4)	% positive and significant coefficients (5)
Analgesics	0.0037	461	95.01%	315	99.68%
Bath Soaps	0.0050	109	90.83%	59	100.00%
Bathroom tissues	0.0021	112	59.82%	39	53.85%
Beers	0.0079	414	96.86%	330	100.00%
Bottled juices	0.0061	418	70.33%	216	79.17%
Canned soups	0.0064	368	73.37%	164	85.98%
Canned tuna	0.0090	219	83.56%	138	92.03%
Cereals	0.0012	408	62.99%	139	67.63%
Cheese	0.0053	529	72.59%	286	84.27%
Cigarettes	0.0015	282	92.91%	163	100.00%
Cookies	0.0088	877	85.52%	565	97.70%
Crackers	0.0115	248	91.94%	192	96.35%
Dish detergents	0.0056	247	87.45%	150	94.67%
Fabric softeners	0.0046	280	84.29%	143	93.01%
Front end candies	0.0148	375	78.93%	196	94.90%
Frozen dinners	0.0110	232	96.55%	175	100.00%
Frozen entrees	0.0114	750	94.80%	538	99.26%
Frozen juices	0.0114	155	90.32%	92	96.74%
Grooming products	0.0094	965	91.40%	626	98.40%
Laundry detergents	0.0025	514	80.16%	251	91.24%
Oatmeal	0.0039	85	74.12%	42	88.10%
Paper towels	0.0034	103	59.22%	41	60.98%
Refrigerated juices	0.0030	192	69.27%	79	64.56%
Shampoos	0.0077	1,661	87.96%	834	98.92%
Snack crackers	0.0094	352	89.77%	235	95.74%
Soaps	0.0078	270	85.56%	145	97.93%
Soft drinks	0.0130	1,184	89.10%	778	96.27%
Toothbrushes	0.0103	333	93.39%	234	98.72%
Toothpastes	0.0089	467	91.86%	299	99.00%
Average	**0.0071**	**435**	**83.44%**	**257**	**90.52%**

Notes: Results of product-level regression. The dependent variable in all regressions is the share of price changes for each product at each store. For each product category, column 1 presents the average of the estimated coefficients of the log of the average sales volumes. The regressions also include controls for the median income, the share of ethnic minorities, the unemployment rate, and the pricing zone of the store. Column 2 presents the total number of coefficients. Column 3 presents the % of positive coefficients out of all coefficients. Column 4 presents the total number of coefficients that are statistically significant at the 5% level. Column 5 presents the % of coefficients that are positive and statistically significant, at the 5% level.

Appendix P. Controlling for peak days

Bonomo et al. (2022) show that the majority of price changes occur during "peak days." Following their definition, for each category in each store we identify peak weeks as the subset of the most active days that jointly account for one-half of all price changes in a store over the entire sample period. We then define a dummy for peak weeks that equals 1 if a week is a peak week and 0 otherwise.

In Tables P1–P4, we present the results of estimating category-level regressions of the following form:

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(average\ sales\ volume_{i,s}\right) + \beta_2 peak\text{-}days_{s,t} + \gamma \boldsymbol{X}_{i,s,t} + month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \quad \text{(P1)}$$

where *small price change* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. The variable $peak\text{-}days$ is a dummy that equals 1 if week *t* in store *s* is a peak day **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate separate regressions for each product category, clustering the errors by product. As we do in the paper, we use observations on price changes only if we observe the price in both week *t* and *t* + 1 and the post-change price remained unchanged for at least 2 weeks.

The coefficient columns in the sales volume and the revenue panels of Table P1 report the coefficients of sales volume and peak-week, respectively in a regression that also includes fixed effects for months, years, stores and products. 27 of the sales volume coefficients are positive. 18 of the coefficients are statistically significant and 2 more are marginally significant. The average coefficient is 0.017, suggesting that a 1% increase in the sales volume is associated with a 1.7% increase in the likelihood of a small price change.

11 of the coefficients of the peak-week dummy are not statistically significant. 13 are negative and statistically significant and only 5 are positive and statistically significant.

The results therefore suggest that the positive correlation between sales volumes and small price changes holds also when we control for peak weeks, but that small price changes are not more common on peak weeks than on other weeks.

Table P2 reports the results when we add controls for the log of the average price, the log of the absolute change in the wholesale price, a control for sale- and bounce-back prices (which we identify using the sales filter algorithm of Fox and Syed 2016), and Dominick's pricing zone. In Table P3, we also add a control for 9-ending prices. In both tables, we find that 26 of the 29 coefficients are positive. 14 of the positive coefficients are statistically significant, and two more are marginally significant. The average coefficient is 0.010, suggesting that a 1% increase in the sales volume is associated with a 1.0% increase in the likelihood of a small price change.

As a further control for the effects of sales on the results, in Table P4 we focus on regular prices by excluding all sale- and bounce-back prices. When we focus on regular prices, we find that 27 of the 29 coefficients are positive. 18 are statistically significant, and 5 more are marginally significant. The average coefficient is 0.021, suggesting that a 1% increase in the sales volume is associated with a 2.1% increase in the likelihood of a small price change.

Thus, adding control for peak weeks does not change our main results regarding the correlation between sales volumes and small price changes.

Table P1. Controlling for peak days. Baseline regressions

Category	Sales Volume		Peak days		No. of Observations
	Coefficient	Std.	Coefficient	Std.	
Analgesics	0.0168***	0.0040	0.003	0.0117	74,451
Bath Soap	0.0093	0.0128	0.0202	0.0127	6,650
Bathroom Tissues	0.0576***	0.0087	0.0036	0.0131	56,458
Beer	0.0019***	0.0006	0.0065***	0.0015	187,691
Bottled Juice	0.0366***	0.0079	-0.0508***	0.0089	224,857
Canned Soup	0.0033	0.0090	-0.0567***	0.0098	233,779
Canned Tuna	0.0094	0.0066	0.0151	0.0108	112,629
Cereals	0.0072	0.0066	-0.0621***	0.0141	141,087
Cheese	0.0117***	0.0040	-0.0545***	0.0100	357,679
Cigarettes	0.0031	0.0049	0.0824***	0.0050	24,553
Cookies	0.01***	0.0019	-0.0264***	0.0079	317,932
Crackers	0.0047	0.0033	-0.0496***	0.0128	115,658
Dish Detergent	0.03***	0.0071	-0.0127	0.0168	85,222
Fabric Softener	0.0139**	0.0069	0.0274**	0.0128	85,337
Front-End-Candies	0.0104***	0.0040	-0.0177	0.0143	148,200
Frozen Dinners	0.0494***	0.0068	0.0163*	0.0084	52,893
Frozen Entrees	0.0258***	0.0026	-0.0829***	0.0061	345,223
Frozen Juices	0.0173**	0.0073	-0.0562***	0.0168	118,582
Grooming Products	0.0091***	0.0033	0.0093***	0.0036	101,944
Laundry Detergents	0.021***	0.0046	0.0083	0.0116	121,566
Oatmeal	0.0189	0.0125	-0.086***	0.0217	25,523
Paper Towels	0.0294*	0.0156	-0.0887***	0.0185	48,199
Refrigerated Juices	0.0142*	0.0077	-0.0278***	0.0110	108,965
Shampoos	0.0079***	0.0025	0.0245***	0.0033	88,193
Snack Crackers	0.002	0.0027	0.0018	0.0134	176,527
Soap	0.0277***	0.0089	-0.0355***	0.0117	56,725
Soft Drinks	0.0307***	0.0044	-0.0431***	0.0085	243,837
Toothbrushes	0.0128***	0.0046	0.0053	0.0098	52,185
Toothpastes	0.0009	0.0040	-0.0029	0.0093	100,845
Average	**0.0170**	**0.0061**	**-0.0183**	**0.0109**	**131,496**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product *i* in store *s* over the sample period and a dummy for peak days that equals 1 if it is one of the weeks with the largest number of price changes, so that all the peak weeks account for 50% of all the price changes. The regressions also include fixed effects for stores, products, months, and years. We estimate separate regressions for each product category, clustering the errors by product.
* $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table P2. Controlling for peak days with additional controls

Category	Sales Volume		Peak days		No. of Observations
	Coefficient	Std.	Coefficient	Std.	
Analgesics	0.013***	0.0039	-0.0065	0.0131	74,451
Bath Soap	0.0056	0.0129	0.0097	0.0098	6,650
Bathroom Tissues	0.0195**	0.0083	-0.0068	0.0130	56,458
Beer	0.0042***	0.0007	0.0049***	0.0011	187,691
Bottled Juice	0.02***	0.0069	-0.0343***	0.0085	224,857
Canned Soup	-0.0035	0.0087	-0.0344***	0.0094	233,779
Canned Tuna	-0.0012	0.0059	0.0139	0.0110	112,629
Cereals	0.0084	0.0065	-0.1023***	0.0146	141,087
Cheese	0.0074**	0.0034	-0.0536***	0.0097	357,679
Cigarettes	0.0008	0.0047	0.0818***	0.0051	24,553
Cookies	0.009***	0.0020	-0.0326***	0.0079	317,932
Crackers	0.0041	0.0031	-0.0476***	0.0129	115,658
Dish Detergent	0.0255***	0.0063	-0.034**	0.0156	85,222
Fabric Softener	0.0018	0.0057	0.0145	0.0110	85,337
Front-End-Candies	-0.0036	0.0033	0.0227*	0.0121	148,200
Frozen Dinners	0.0331***	0.0060	0.0496***	0.0089	52,893
Frozen Entrees	0.0189***	0.0026	-0.0429***	0.0058	345,223
Frozen Juices	0.0121*	0.0069	-0.0541***	0.0156	118,582
Grooming Products	0.011***	0.0033	0.0005	0.0033	101,944
Laundry Detergents	0.0128***	0.0039	-0.0004	0.0105	121,566
Oatmeal	0.0111	0.0122	-0.0598***	0.0214	25,523
Paper Towels	0.0171	0.0172	-0.0688***	0.0193	48,199
Refrigerated Juices	0.0065	0.0079	-0.0201*	0.0108	108,965
Shampoos	0.0089***	0.0025	0.0199***	0.0031	88,193
Snack Crackers	0.0035	0.0027	0.0012	0.0135	176,527
Soap	0.0152*	0.0081	-0.0331***	0.0105	56,725
Soft Drinks	0.0145***	0.0019	-0.0333***	0.0075	243,837
Toothbrushes	0.0093**	0.0047	0.0082*	0.0097	52,185
Toothpastes	0.001	0.0038	-0.0183**	0.0088	100,845
Average	**0.0099**	**0.0057**	**-0.0157**	**0.0105**	**131,496**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product *i* in store *s* over the sample period and a dummy for peak days that equals 1 if it is one of the weeks with the largest number of price changes, so that all the peak weeks account for 50% of all the price changes. The regressions also include the following independent variables: the products' average price, percentage changes in the wholesale price and a dummy for sale and bounce-back prices, as well as fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table P3. Bonomo regressions – including a control for 9-ending prices

Category	Sales Volume		Peak days		No. of Observations
	Coefficient	Std.	Coefficient	Std.	
Analgesics	0.0128***	0.0038	-0.0076**	0.0129	74,451
Bath Soap	0.0055	0.0125	0.0087***	0.0100	6,650
Bathroom Tissues	0.0189**	0.0081	-0.0208**	0.0136	56,458
Beer	0.0042***	0.0007	0.0049***	0.0011	187,691
Bottled Juice	0.0199***	0.0070	-0.0346***	0.0084	224,857
Canned Soup	-0.0008	0.0085	-0.0325***	0.0093	233,779
Canned Tuna	-0.0015	0.0058	0.0139**	0.0108	112,629
Cereals	0.0085	0.0065	-0.1025**	0.0145	141,087
Cheese	0.0072**	0.0034	-0.0557***	0.0098	357,679
Cigarettes	0.0009	0.0046	0.0852***	0.0058	24,553
Cookies	0.0091***	0.0019	-0.0347***	0.0080	317,932
Crackers	0.0048	0.0031	-0.0528**	0.0119	115,658
Dish Detergent	0.0258***	0.0062	-0.0356**	0.0155	85,222
Fabric Softener	0.0023	0.0057	0.0146**	0.0110	85,337
Front-End-Candies	-0.0034	0.0033	0.0242**	0.0121	148,200
Frozen Dinners	0.0342***	0.0060	0.0555***	0.0083	52,893
Frozen Entrees	0.0192***	0.0026	-0.0438***	0.0059	345,223
Frozen Juices	0.0131*	0.0067	-0.052**	0.0146	118,582
Grooming Products	0.0112***	0.0033	0.0011***	0.0034	101,944
Laundry Detergents	0.013***	0.0038	0.0001**	0.0106	121,566
Oatmeal	0.0091	0.0116	-0.0569**	0.0218	25,523
Paper Towels	0.0184	0.0171	-0.0751**	0.0184	48,199
Refrigerated Juices	0.0066	0.0078	-0.024**	0.0111	108,965
Shampoos	0.0089***	0.0025	0.0199***	0.0031	88,193
Snack Crackers	0.0035	0.0027	0.0008**	0.0134	176,527
Soap	0.0184**	0.0080	-0.0284***	0.0102	56,725
Soft Drinks	0.0137***	0.0018	-0.0331***	0.0075	243,837
Toothbrushes	0.0089*	0.0046	0.0056***	0.0095	52,185
Toothpastes	0.0012	0.0038	-0.019***	0.0088	100,845
Average	**0.0101**	**0.0056**	**-0.0164**	**0.0104**	**131,496**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product *i* in store *s* over the sample period and a dummy for peak days that equals 1 if it is one of the weeks with the largest number of price changes, so that all the peak weeks account for 50% of all the price changes. The regressions also include the following independent variables: the products' average price, percentage changes in the wholesale price, a dummy for sale and bounce-back prices, a dummy for 9-ending prices that equals 1 if the right-most digit is 9, as well as fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table P4. Bonomo regressions – focusing on regular prices

Category	Sales Volume		Peak days		No. of Observations
	Coefficient	Std.	Coefficient	Std.	
Analgesics	0.014*	0.0080	-0.0266	0.0189	24,729
Bath Soap	-0.0272	0.0253	0.0082	0.0192	1,466
Bathroom Tissues	0.037***	0.0094	-0.0364**	0.0182	19,285
Beer	0.0182***	0.0055	-0.0087*	0.0130	12,080
Bottled Juice	0.035***	0.0089	-0.0213	0.0164	60,015
Canned Soup	0.0133**	0.0071	0.0095	0.0117	95,310
Canned Tuna	0.0132	0.0083	-0.0034	0.0202	31,922
Cereals	0.0275***	0.0071	-0.1595***	0.0209	72,789
Cheese	0.0139***	0.0046	-0.0516***	0.0156	92,758
Cigarettes	-0.0006	0.0053	0.0759***	0.0065	20,692
Cookies	0.0088**	0.0037	-0.0454***	0.0163	66,087
Crackers	0.0174***	0.0065	-0.1153***	0.0253	24,771
Dish Detergent	0.0306***	0.0061	-0.1054***	0.0305	26,735
Fabric Softener	0.0228***	0.0078	0.01	0.0226	27,488
Front-End-Candies	0.0018	0.0030	-0.0045	0.0130	77,323
Frozen Dinners	0.0698***	0.0103	0.0557***	0.0176	12,287
Frozen Entrees	0.0239***	0.0039	-0.0004	0.0074	117,044
Frozen Juices	0.0229***	0.0086	-0.0508**	0.0234	40,517
Grooming Products	0.0158	0.0110	0.0094	0.0107	22,102
Laundry Detergents	0.0175***	0.0058	0.0001	0.0194	42,121
Oatmeal	0.0597***	0.0113	-0.0119	0.0269	13,605
Paper Towels	0.0312*	0.0158	-0.0668**	0.0278	9,243
Refrigerated Juices	0.0259**	0.0123	-0.0163	0.0318	23,705
Shampoos	0.0225***	0.0080	0.0082	0.0096	16,099
Snack Crackers	0.0173***	0.0053	-0.0685**	0.0282	38,123
Soap	0.0539***	0.0119	-0.0742***	0.0210	16,882
Soft Drinks	0.0059*	0.0033	0.0345***	0.0119	49,989
Toothbrushes	0.0195*	0.0102	-0.0113	0.0270	13,695
Toothpastes	0.0058	0.0082	-0.0169	0.0195	28,039
Average	**0.0213**	**0.0084**	**-0.0236**	**0.0190**	**37,824**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product *i* in store *s* over the sample period and a dummy for peak days that equals 1 if it is one of the weeks with the largest number of price changes, so that all the peak weeks account for 50% of all the price changes. The regressions also include the following independent variables: the products' average price, percentage changes in the wholesale price, a dummy for 9-ending prices that equals 1 if the right-most digit is 9, as well as fixed effects for years, months, stores, and products. We exclude observations on sales and bounce back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix Q. Estimation using only data on products that are sold in single units

In the paper, we study the correlation between the sales volume and the likelihood of small price changes. There, we define a unit sold the way it is defined by the retailer. I.e., a 6-pack of beer is counted as one unit. However, this might bias the results if products that are sold in packages have different properties than products that are sold in single units. We therefore repeat our estimation, after excluding observations on products that are sold in packages.

We therefore estimate:

$$small\ price\ change_{i,s,t} = \alpha + \beta ln\left(average\ sales\ volume_{i,s}\right) + \gamma X_{i,s,t} + month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \quad \text{(Q1)}$$

where small price change is a dummy that equals 1 if a price change of product *i* in store *s* in week *t* is less or equal to 10¢, and 0 otherwise. As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t* + 1 and the post change price remained unchanged for at least 2 weeks.

The average sales volume is the average sales volume of product *i* in store *s* over the sample period. By taking the average over a long period, we obtain an estimate of the expected sales volume that does not depend on transitory shocks or sales. **X** is a matrix of other control variables. Month and year are fixed effects for the month (to control for seasonality) and the year of the price change. To control for the differences across stores and products, δ and μ are fixed effects for stores and products, respectively, while *u* is an i.i.d error term.

Table Q1 reports the coefficient estimates of the key variable, average sales volume, for each product category. Column 1 reports the results of baseline regressions that exclude the **X** matrix. I.e, the regressions include only the average sales volume and fixed effects for months, years, stores, and products.

We find that in all 29 product categories, the coefficients are positive and statistically significant. The estimated effect is economically significant. The average coefficient is 0.027, suggesting that an increase of 1% in the sales volume is associated with an increase of 2.7 percentage points in the likelihood that a price change will be small.

In column 2, we add the matrix **X** which includes the following control variables: the log of the average price to control for the price level effect on the size of price changes, the percentage change in the wholesale price, and control for sale- and bounce-back prices, all as defined above. The estimation results are similar to what we report in column 1. The coefficients of the average sales volume are positive and statistically significant in 28 categories, and marginally significant in 1 more. The average coefficient is 0.020. Thus, even after including the controls, we still find that increasing the average sales volume by 1% is associated with an increase of 2.0 percentage points in the likelihood of a small price change.

In column 3, we add a dummy for 9-ending prices as an additional control because when the pre-change price is 9-ending, price changes tend to be larger than when the pre-change price ends in other digits (Levy et al. 2020). Thus, if products with high sales volume tend to have non-9-ending prices, then it might lead to high sales volume products' prices changing by small amounts.

However, adding this dummy does not change the main result appreciably. All 29 coefficients remain positive. 28 are statistically significant, and 1 more is marginally significant. Controlling for 9-ending prices, increasing the average sales volume by 1% is associated with a 2.0 percentage points increase in the likelihood of a small price change, on average.

In column 4, we focus on regular prices by excluding sale- and bounce-back prices. We do this for two reasons. First, sale- and bounce-back prices tend to be large, and therefore, we need to account for them properly. Second, it is often argued that changes in sale prices have a smaller effect on inflation than changes in regular prices (Nakamura and Steinsson 2008, Midrigan 2011, Anderson et al. 2017, Ray et al. 2023).

We find that when we exclude sale prices, all the coefficients remain positive. 28 are statistically significant, and 1 more is marginally significant. The average coefficient is 0.041, implying that for regular prices, an increase of 1% in the average sales volume is associated with an increase of 4.1 percentage points in the likelihood of a small price change.

Table Q1. Category-level regressions of small price changes and sales volume excluding products sold in packages

Category		(1)	(2)	(3)	(4)
Analgesics	Coefficient (Std.)	0.0262*** (0.0034)	0.019*** (0.0032)	0.0113*** (0.0021)	0.0188*** (0.0031)
	Observations	144,461	144,461	144,461	144,461
Bath Soap	Coefficient (Std.)	0.0293*** (0.008)	0.0277*** (0.0082)	0.0174*** (0.0046)	0.0285*** (0.0081)
	Observations	15,295	15,295	15,295	15,295
Bathroom Tissues	Coefficient (Std.)	0.0328*** (0.0077)	0.008* (0.0072)	0.0137*** (0.0056)	0.0083* (0.0072)
	Observations	140,505	140,505	149,441	140,505
Beer	Coefficient (Std.)	0.013*** (0.0012)	0.0147*** (0.0012)	0.0114*** (0.0008)	0.0147*** (0.0012)
	Observations	290,591	290,591	290,620	290,591
Bottled Juice	Coefficient (Std.)	0.0376*** (0.0051)	0.0271*** (0.0044)	0.017*** (0.0042)	0.026*** (0.0044)
	Observations	471,256	471,256	496,557	471,256
Canned Soup	Coefficient (Std.)	0.0167*** (0.0056)	0.0077*** (0.0051)	0.0121*** (0.0043)	0.0098** (0.0049)
	Observations	461,989	461,989	495,543	461,989
Canned Tuna	Coefficient (Std.)	0.0249*** (0.0055)	0.0146*** (0.0047)	0.0124*** (0.0038)	0.0142*** (0.0046)
	Observations	206,937	206,937	213,043	206,937
Cereals	Coefficient (Std.)	0.021*** (0.0037)	0.0158** (0.0034)	0.0133*** (0.003)	0.0157*** (0.0035)
	Observations	354,887	354,887	357,120	354,887
Cheese	Coefficient (Std.)	0.021*** (0.0029)	0.012*** (0.0025)	0.0084*** (0.0023)	0.0118*** (0.0025)
	Observations	780,089	780,089	796,150	780,089
Cigarettes	Coefficient (Std.)	0.0084** (0.0046)	0.0073** (0.0045)	0.0095** (0.0028)	0.0074** (0.0044)
	Observations	36,157	36,157	36,157	36,157
Cookies	Coefficient (Std.)	0.0276*** (0.0018)	0.0225*** (0.0017)	0.018*** (0.0014)	0.0227*** (0.0017)
	Observations	668,546	668,546	688,761	668,546
Crackers	Coefficient (Std.)	0.0387*** (0.0031)	0.0301*** (0.0027)	0.0232*** (0.0022)	0.0306*** (0.0027)
	Observations	239,253	239,253	245,185	239,253
Dish Detergent	Coefficient (Std.)	0.0394*** (0.0044)	0.0279*** (0.0036)	0.0212*** (0.0031)	0.0278*** (0.0035)
	Observations	188,737	188,737	189,633	188,737
Fabric Softener	Coefficient (Std.)	0.0246*** (0.0048)	0.0118*** (0.0044)	0.0089*** (0.0034)	0.0121*** (0.0043)
	Observations	178,724	178,724	181,056	178,724
Front-End-Candies	Coefficient (Std.)	0.0103*** (0.004)	0.0161*** (0.0041)	0.0048*** (0.0026)	0.0163*** (0.0041)
	Observations	192,037	192,037	278,853	192,037
Frozen Dinners	Coefficient (Std.)	0.0478*** (0.0035)	0.0385*** (0.0031)	0.0308*** (0.0023)	0.0411*** (0.0032)
	Observations	187,022	187,022	203,191	187,022

Table Q1. (Cont.)

Category		(1)	(2)	(3)	(4)
Frozen Entrees	Coefficient (Std.)	0.0288*** (0.0024)	0.0281*** (0.002)	0.0193*** (0.0015)	0.0289*** (0.002)
	Observations	694,903	694,903	864,832	694,903
Frozen Juices	Coefficient (Std.)	0.0289*** (0.0049)	0.0223*** (0.0044)	0.0162*** (0.0035)	0.0227*** (0.0043)
	Observations	286,846	286,846	308,817	286,846
Grooming Products	Coefficient (Std.)	0.0186*** (0.0023)	0.0208*** (0.0024)	0.0135*** (0.0016)	0.021*** (0.0024)
	Observations	269,513	269,513	269,873	269,513
Laundry Detergents	Coefficient (Std.)	0.0198*** (0.0032)	0.0094*** (0.0028)	0.0082*** (0.0023)	0.0099*** (0.0028)
	Observations	270,780	270,780	272,765	270,780
Oatmeal	Coefficient (Std.)	0.0283*** (0.0081)	0.0151*** (0.0067)	0.0129*** (0.0058)	0.0153*** (0.0067)
	Observations	79,488	79,488	79,983	79,488
Paper Towels	Coefficient (Std.)	0.0479*** (0.0114)	0.026*** (0.0099)	0.0254*** (0.0083)	0.0264*** (0.01)
	Observations	111,012	111,012	116,204	111,012
Refrigerated Juices	Coefficient (Std.)	0.0357*** (0.0047)	0.0209*** (0.0039)	0.0177*** (0.0033)	0.0208*** (0.0039)
	Observations	304,028	304,028	306,865	304,028
Shampoos	Coefficient (Std.)	0.0164*** (0.0015)	0.0202*** (0.0016)	0.0119*** (0.001)	0.0202*** (0.0016)
	Observations	260,918	260,918	261,778	260,918
Snack Crackers	Coefficient (Std.)	0.033*** (0.0032)	0.0284*** (0.003)	0.0236*** (0.0026)	0.0285*** (0.003)
	Observations	390,331	390,331	398,665	390,331
Soaps	Coefficient (Std.)	0.0373*** (0.0055)	0.0224*** (0.005)	0.0162*** (0.0037)	0.0234*** (0.0049)
	Observations	151,326	151,326	152,379	151,326
Soft Drinks	Coefficient (Std.)	0.026*** (0.0015)	0.0243*** (0.0014)	0.0099*** (0.0018)	0.0238*** (0.0013)
	Observations	1,247,126	1,247,126	1,350,618	1,247,126
Toothbrushes	Coefficient (Std.)	0.0212*** (0.0029)	0.0204*** (0.0029)	0.0137*** (0.0018)	0.0198*** (0.0029)
	Observations	121,951	121,951	125,380	121,951
Toothpastes	Coefficient (Std.)	0.0124*** (0.0026)	0.0113*** (0.0022)	0.0088*** (0.0016)	0.0113*** (0.0022)
	Observations	263,971	263,971	264,317	263,971
Average coefficients		**0.0267**	**0.0197**	**0.0199**	**0.0415**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of average sales volume of product *i* in store *s* over the sample period. Column 1 reports the results of the baseline regression that includes only the log of average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and a control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix R. Storable vs. non-storable products

It's possible that retailers have different strategies for storable vs. non-storable products. To test whether this has an effect on the correlation between small price changes and sales volumes, we estimate the following regression, using pooled data from all product categories:

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(average\ sales\ volume_{i,s}\right) + \beta_2 ln\left(average\ sales\ volume_{i,s}\right) \times non\text{-}storable_i + \beta_3 non\text{-}storable_i + \gamma X_{i,s,t} + month_t + year_t + \kappa_i + \delta_s + \mu_i + u_{i,s,t} \quad \text{(R1)}$$

where small price change is a dummy that equals 1 if a price change of product *i* in store *s* in week *t* is less or equal to 10¢, and 0 otherwise. As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t* + 1 and the post change price remained unchanged for at least 2 weeks. The average sales volume is the average sales volume of product *i* in store *s* over the sample period.[6] By taking the average over a long period, we obtain an estimate of the expected sales volume that does not depend on transitory shocks or sales. **X** is a matrix of other control variables. Month and year are fixed effects for the month (to control for seasonality) and the year of the price change. To control for the differences across stores and products, κ, δ and μ are fixed effects for categories, stores and products, respectively, while *u* is an i.i.d error term. $Non\text{-}storable$ is a dummy for products that have a high cost of storage. It equals 1 if a product belongs to either of the cheese, frozen dinners, frozen entrees, frozen juices, or refrigerated juices categories.

Table R1 reports the coefficient estimates of the key variables, average sales volume, and the interaction between the average sales volume and the dummy for non-storable products. Column 1 reports the results of baseline regressions that exclude the matrix **X**.

[6] In calculating the average sales volume, we need to account for missing observations, because a missing observation in week *t* implies that the product was either out of stock or had 0 sales on that week. Thus, averaging over the available observations can lead to an upward bias for products that are sold in small numbers. Therefore, for each product in each store, we calculate the average by first determining the total number of units sold over all available observations. We then identify the first and last week for which we have observations, and calculate the average for each product-store as $\frac{total\ no.\ of\ units\ sold}{last\ week - first\ week}$. The resulting figure is smaller than we would obtain if we averaged over all available observations (which would not include obsservations on weeks with 0 sales).

I.e, the regressions include only the average sales volume, the interaction between the average sales volume and the dummy for non-storable products, the dummy for non-storable products, and fixed effects for months, years, stores, categories, and products.

We find that the coefficient of the sales volume is positive and statistically significant. Its value is similar to the value we report in the paper, 0.025. The value of the coefficient of the interaction between the sales volume and the dummy for non-storable products is small, 0.004, positive and statistically significant. Thus, the results suggests that the correlation between sales volumes and small price changes might be slightly stronger for products that are harder to store than for other products.

In column 2, we add the matrix **X** which includes the following control variables: the log of the average price to control for the price level effect on the size of price changes, the percentage change in the wholesale price, and control for sale- and bounce-back prices, all as defined above. We find that the coefficient of the interaction term is now negative, but it is not statistically significant.

In column 3, we add a dummy for 9-ending prices as an additional control because when the pre-change price is 9-ending, price changes tend to be larger than when the pre-change price ends in other digits (Levy et al. 2020). Thus, if products with high sales volume tend to have non-9-ending prices, then it might lead to high sales volume products' prices changing by small amounts. According to our estimates, the coefficient of the interaction term remains negative, and it is not statistically significant.

In column 4, we focus on regular prices by excluding sale- and bounce-back prices. We do this for two reasons. First, sale- and bounce-back prices tend to be large, and therefore, we need to account for them properly. Second, it is often argued that changes in sale prices have a smaller effect on inflation than changes in regular prices (Nakamura and Steinsson 2008, Midrigan 2011, Anderson et al. 2017, Ray et al. 2023).

We find that when we exclude sale prices, the results remain similar to our findings in columns 2 and 3. The coefficient of the interaction term remains small, negative and statistically insignificant. We therefore conclude that the correlation between the likelihood of a small price change and the sales volumes is similar across storable and less storable products.

Table R1. Pooled regressions of small price changes and sales volume, with controls for non-durable products

	(1)	(2)	(3)	(4)
Average sales volume	0.025***	0.018***	0.018***	0.018***
	(0.001)	(0.001)	(0.001)	(0.001)
Average sales volume	0.004**	−0.003	−0.003	−0.003
× non-storable	(0.002)	(0.002)	(0.002)	(0.002)
Observations	9,553,542	9,553,542	9,553,542	2,328,405

Notes: The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variable is the log of the average sales volume of product *i* in store *s* over the sample period. Non-storable is a dummy for products that are costly to store. Column 1 reports the results of baseline regression that includes only the average sales volume and the fixed effects for months, years, stores, and products. In column 2, we add the following controls: the log of the average price, the log of the absolute change in the wholesale price, and control for sale- and bounce-back prices, which we identify using a sales filter algorithm. In column 3, we add a dummy for 9-ending prices as an additional control. In column 4, we focus on regular prices by excluding the sale- and bounce-back prices. All regressions also include a dummy for non-storable products, and fixed effects for categories, stores, products, years, and months. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Appendix S. The correlation between the sales volume and the likelihood of price increases vs. decreases

Our model implies that the correlation between the sales volume and the likelihood of a small price change is symmetric. Products with high sales volumes should be more likely to both increase and decrease than products with lower sales volumes. However, empirical evidence suggests that this might not be the case (Peltzman, 2000). For example, if shoppers are not attentive to small price changes (Chen et al., 2008, Chakraborty et al., 2015), then retailers may gain from small price increases and lose from small price decreases.

Therefore, in Tables S1–S4, we present the results of the category-level regression estimations. The regressions we estimate are of the following form:

$$small\ price\ change_{i,s,t} = \alpha + \beta_1 ln\left(average\ sales\ volume_{i,s}\right) + \beta_2 ln\left(average\ revenue_{i,s}\right) + \gamma \boldsymbol{X}_{i,s,t} + month_t + year_t + \delta_s + \mu_i + u_{i,s,t} \quad \text{(S1)}$$

where *small price increase (decrease)* is a dummy that equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The *average sales volume* is the average sales volume of product *i* in store *s* over the sample period. The *average revenue* is the average revenue of product *i* in store *s* over the sample period. **X** is a matrix of other control variables. *Month* and *year* are fixed effects for the month and the year of the price change. δ and μ are fixed effects for stores and products, respectively, and *u* is an i.i.d error term. We estimate a separate regression for each product category, clustering the errors by product. As we do in the paper, we use observations on price changes only if we observe the price in both weeks *t* and *t*+1 and the post-change price remained unchanged for at least 2 weeks.

Table S1 reports the results of baseline regressions that exclude the matrix **X**. I.e, the regressions include only the average sales volume and fixed effects for months, years, stores, and products.

For price increases, we find that in all 29 product categories, the coefficients are positive and statistically significant. For price decreases, 27 of the coefficients are positive, and 20 of them are statistically significant. Two more are marginally significant.

It therefore seems that the correlation between price increases and the likelihood of small price changes is stronger than the correlation between price decreases and the likelihood of small price changes. This is also corroborated by the size of the coefficients. In 21 categories, the coefficients of price increases are larger than the coefficients of price decreases, yielding an average coefficient of 0.0195 for price increases and 0.0146 for price decreases.

In Table S2, we add the **X** matrix which includes the following control variables: the log of the average price to control for the price level effect on the size of price changes, the percentage change in the wholesale price, and control for sale- and bounce-back prices, all as defined above. The results are similar to what we report above. When we focus on price increases, we find that all the coefficients are positive, and that 28 of them are statistically significant. When we focus on price decreases, we find that 27 of the coefficients are positive, 19 of them are statistically significant, and 2 more are marginally significant. Again, the average coefficient of price increases, 0.0162, is larger than the average coefficients of price decreases, 0.0127.

In Table S3, we add a dummy for 9-ending prices as an additional control because when the pre-change price is 9-ending, price changes tend to be larger than when the pre-change price ends in other digits (Levy et al. 2020). Thus, if products with high sales volume tend to have non-9-ending prices, then it might lead to high sales volume products' prices changing by small amounts. The results remain almost unchanged relative to the figures presented in Table S2.

In Table S4, we focus on regular prices by excluding sale- and bounce-back prices. We do this for two reasons. First, sale- and bounce-back prices tend to be large, and therefore, we need to account for them properly. Second, it is often argued that changes in sale prices have a smaller effect on inflation than changes in regular prices (Nakamura and Steinsson 2008, Midrigan 2011, Anderson et al. 2017, Ray et al. 2023).

We find that when we exclude sale prices, 29 of the coefficients of the price increase regressions are positive, and all of them are statistically significant. In the regressions of price decreases, 26 of the coefficients are positive and 20 of them are statistically significant. 4 more are marginally significant. The average coefficient of the price increase regressions is 0.0303, again higher than the average coefficient of the price decrease regressions, 0.0213.

We conclude that the correlation is stronger for price increases than for price decreases. Therefore, although our model suggests a symmetric correlation, it seems that there are other forces at play as well. One possibility is consumer inattention, which makes small price increases more profitable than small price decreases, as in Chen et al. (2008).

Table S1. Category-level regressions of small price changes and sales volume, price increases vs. price decreases

Category	Price Increase			Price Decrease		
	Coefficient	Std.	Obs.	Coefficient	Std.	Obs.
Analgesics	0.0107***	0.0378	93,254	0.021***	0.0034	51,207
Bath Soap	0.0211***	0.0870	9,877	0.0047	0.0058	5,418
Bathroom Tissues	0.0284***	0.0498	96,660	0.0156*	0.0087	52,781
Beer	0.013***	0.0273	128,309	0.0049***	0.0007	162,311
Bottled Juice	0.023***	0.0800	298,844	0.0173***	0.0061	197,713
Canned Soup	0.019***	0.0390	334,515	0.0015	0.0066	161,028
Canned Tuna	0.0164***	0.0569	110,869	0.0139***	0.0044	102,174
Cereals	0.02***	0.0326	262,840	0.0077	0.0049	94,280
Cheese	0.0176***	0.0842	506,336	0.0132***	0.0032	289,814
Cigarettes	0.0128***	0.0386	27,370	-0.0024	0.0035	8,787
Cookies	0.0234***	0.0166	440,768	0.0178***	0.0019	247,993
Crackers	0.032***	0.0804	152,814	0.0267***	0.0035	92,371
Dish Detergent	0.0304***	0.0928	120,854	0.0307***	0.0047	68,779
Fabric Softener	0.0123***	0.1206	110,126	0.0146***	0.005	70,930
Front-End-Candies	0.0073**	0.0199	168,056	-0.0145***	0.0036	110,797
Frozen Dinners	0.0262***	0.0252	142,131	0.0523***	0.0044	61,060
Frozen Entrees	0.0178***	0.0097	593,786	0.0242***	0.0023	271,046
Frozen Juices	0.0196***	0.0361	201,311	0.0256***	0.0059	107,506
Grooming Products	0.0084***	0.0254	177,107	0.0117***	0.0022	92,766
Laundry Detergents	0.0102***	0.0369	166,698	0.0164***	0.0031	106,067
Oatmeal	0.0246***	0.0159	55,650	0.0185**	0.0086	24,333
Paper Towels	0.0362***	0.1112	71,451	0.0106	0.0095	44,753
Refrigerated Juices	0.0348***	0.0371	195,097	0.0161***	0.0047	111,768
Shampoos	0.0096***	0.0136	174,176	0.0068***	0.0015	87,602
Snack Crackers	0.0292***	0.0661	253,228	0.0252***	0.0037	145,437
Soap	0.0236***	0.0198	94,977	0.0218***	0.0061	57,402
Soft Drinks	0.0139***	0.1117	1,037,125	0.0048*	0.0028	313,493
Toothbrushes	0.0144***	0.0322	83,428	0.0105***	0.0028	41,952
Toothpastes	0.0091***	0.0354	189,477	0.0069	0.0042	74,840
Average	**0.0195**	**0.0035**	**217,143**	**0.0146**	**0.0044**	**112,290**

Notes: The table reports the results of category-level fixed effect regressions of the probability of a small price change. We estimate separate regressions for price increases and for price decreases. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product *i* in store *s* over the sample period and the log of the average revenue of product *i* in store *s* over the sample period. The regressions also includes fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table S2. Category-level regressions of small price changes and sales volume, price increases vs. price decreases, with extra controls

Category	Price Increase			Price Decrease		
	Coefficient	Std.	Obs.	Coefficient	Std.	Obs.
Analgesics	0.0097***	0.0024	93,254	0.0159***	0.0031	51,207
Bath Soap	0.0201***	0.0064	9,877	0.0042	0.006	5,418
Bathroom Tissues	0.0086	0.0058	96,660	0.0124	0.0079	52,781
Beer	0.0167***	0.0014	128,309	0.0077***	0.0007	162,311
Bottled Juice	0.0175***	0.0037	298,844	0.0172***	0.0055	197,713
Canned Soup	0.016***	0.004	334,515	0.0023	0.0063	161,028
Canned Tuna	0.0125***	0.0043	110,869	0.0125***	0.0042	102,174
Cereals	0.0164***	0.0028	262,840	0.0053	0.0048	94,280
Cheese	0.0102***	0.0022	506,336	0.0082***	0.003	289,814
Cigarettes	0.0131***	0.0028	27,370	-0.0013	0.0037	8,787
Cookies	0.0199***	0.0016	440,768	0.0178***	0.0019	247,993
Crackers	0.0239***	0.0025	152,814	0.0237***	0.0034	92,371
Dish Detergent	0.0225***	0.0033	120,854	0.0245***	0.0044	68,779
Fabric Softener	0.0094***	0.0034	110,126	0.0096**	0.0047	70,930
Front-End-Candies	0.0124***	0.0032	168,056	-0.0082***	0.0027	110,797
Frozen Dinners	0.0231***	0.0024	142,131	0.0456***	0.004	61,060
Frozen Entrees	0.0193***	0.0015	593,786	0.023***	0.0022	271,046
Frozen Juices	0.0142***	0.0036	201,311	0.0232***	0.0053	107,506
Grooming Products	0.0117***	0.0017	177,107	0.0149***	0.0022	92,766
Laundry Detergents	0.0068***	0.0023	166,698	0.0102***	0.0031	106,067
Oatmeal	0.0193***	0.0062	55,650	0.007	0.0088	24,333
Paper Towels	0.0332***	0.0083	71,451	0.0116	0.0102	44,753
Refrigerated Juices	0.0221***	0.0034	195,097	0.0105**	0.0043	111,768
Shampoos	0.0128***	0.0011	174,176	0.0086***	0.0015	87,602
Snack Crackers	0.0244***	0.0025	253,228	0.0247***	0.0036	145,437
Soap	0.016***	0.0038	94,977	0.0146***	0.0057	57,402
Soft Drinks	0.0126***	0.0017	1,037,125	0.0052*	0.0027	313,493
Toothbrushes	0.0154***	0.0021	83,428	0.0119***	0.0028	41,952
Toothpastes	0.0107***	0.0019	189,477	0.0058*	0.003	74,840
Average	**0.0162**	**0.0032**	**217,143**	**0.0127**	**0.0042**	**112,290**

The table reports the results of category-level fixed effect regressions of the probability of a small price change. We estimate separate regressions for price increases and for price decreases. The dependent variable is "small price change," which equals 1 if a price change of product i in store s at time t is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product i in store s over the sample period and the log of the average revenue of product i in store s over the sample period. The regressions also include the following independent variables: percentage changes in the wholesale price, a dummy for sale and bounce-back prices, as well as fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table S3. Category-level regressions of small price changes and sales volume, price increases vs. price decreases, with extra controls and a dummy for 9-ending prices

Category	Price Increase			Price Decrease		
	Coefficient	Std.	Obs.	Coefficient	Std.	Obs.
Analgesics	0.0097***	0.0024	93,254	0.0155***	0.0031	51,207
Bath Soap	0.0221***	0.0064	9,877	0.0044	0.0061	5,418
Bathroom Tissues	0.0091	0.0058	96,660	0.0119	0.0079	52,781
Beer	0.0167***	0.0014	128,309	0.0077***	0.0008	162,311
Bottled Juice	0.0175***	0.0037	298,844	0.0155***	0.0056	197,713
Canned Soup	0.0182***	0.0039	334,515	0.0039	0.0062	161,028
Canned Tuna	0.0123***	0.0043	110,869	0.0125***	0.0042	102,174
Cereals	0.0164***	0.0028	262,840	0.0049	0.0048	94,280
Cheese	0.01***	0.0022	506,336	0.0074***	0.003	289,814
Cigarettes	0.0129***	0.0028	27,370	-0.0011	0.0038	8,787
Cookies	0.02***	0.0016	440,768	0.0174***	0.0019	247,993
Crackers	0.0241***	0.0025	152,814	0.0232***	0.0034	92,371
Dish Detergent	0.0227***	0.0033	120,854	0.0236***	0.0042	68,779
Fabric Softener	0.0094***	0.0034	110,126	0.0098**	0.0047	70,930
Front-End-Candies	0.0143***	0.0032	168,056	-0.0076***	0.0026	110,797
Frozen Dinners	0.0244***	0.0023	142,131	0.0453***	0.004	61,060
Frozen Entrees	0.0193***	0.0015	593,786	0.0235***	0.0022	271,046
Frozen Juices	0.015***	0.0036	201,311	0.0226***	0.0052	107,506
Grooming Products	0.0118***	0.0017	177,107	0.0144***	0.0022	92,766
Laundry Detergents	0.0071***	0.0023	166,698	0.0102***	0.0031	106,067
Oatmeal	0.0195***	0.0063	55,650	0.0052	0.0089	24,333
Paper Towels	0.0336***	0.0086	71,451	0.0114	0.0099	44,753
Refrigerated Juices	0.0221***	0.0034	195,097	0.0094**	0.0044	111,768
Shampoos	0.0128***	0.0011	174,176	0.0087***	0.0015	87,602
Snack Crackers	0.0244***	0.0026	253,228	0.0246***	0.0036	145,437
Soap	0.016***	0.0038	94,977	0.0172***	0.0055	57,402
Soft Drinks	0.0125***	0.0016	1,037,125	0.0047*	0.0025	313,493
Toothbrushes	0.0154***	0.0021	83,428	0.0104***	0.0028	41,952
Toothpastes	0.0107***	0.0019	189,477	0.0057*	0.003	74,840
Average	**0.0166**	**0.0032**	**217,143**	**0.0125**	**0.0042**	**112,290**

The table reports the results of category-level fixed effect regressions of the probability of a small price change. We estimate separate regressions for price increases and for price decreases. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product *i* in store *s* over the sample period and the log of the average revenue of product *i* in store *s* over the sample period. The regressions also include the following independent variables: percentage changes in the wholesale price, a dummy for sale and bounce-back prices, and a dummy for 9-ending prices, as well as fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

Table S4. Category-level regressions of small price changes and sales volume, price increases vs. price decreases, focusing on regular prices

Category	Price Increase			Price Decrease		
	Coefficient	Std.	Obs.	Coefficient	Std.	Obs.
Analgesics	0.0157***	0.0047	33,833	0.0346***	0.0087	11,117
Bath Soap	0.052***	0.0143	2,610	0.0209	0.0263	598
Bathroom Tissues	0.0303***	0.0105	27,822	0.0188*	0.0096	19,219
Beer	0.0523***	0.0049	16,369	0.0311***	0.0059	10,979
Bottled Juice	0.0202***	0.006	84,037	0.0219**	0.0087	49,677
Canned Soup	0.0188***	0.0044	121,223	-0.0004	0.007	55,012
Canned Tuna	0.018***	0.0059	35,488	0.0218***	0.006	28,673
Cereals	0.0174***	0.0043	112,141	0.0159***	0.0062	43,226
Cheese	0.0163***	0.0031	145,646	0.0022	0.0048	79,243
Cigarettes	0.0123***	0.0031	24,297	-0.0053	0.0042	5,965
Cookies	0.0371***	0.0033	97,877	0.0227***	0.0036	34,611
Crackers	0.0381***	0.0056	35,793	0.0266***	0.0081	14,236
Dish Detergent	0.0285***	0.0047	29,978	0.0256***	0.0056	23,311
Fabric Softener	0.016***	0.0057	31,744	0.035***	0.0064	24,490
Front-End-Candies	0.0126***	0.0028	65,667	-0.0001	0.0027	45,968
Frozen Dinners	0.0609***	0.0067	19,262	0.06***	0.0063	18,265
Frozen Entrees	0.0411***	0.0036	117,948	0.0266***	0.0034	95,597
Frozen Juices	0.025***	0.0061	50,141	0.027***	0.0068	37,778
Grooming Products	0.0268***	0.0043	37,589	0.0169*	0.0094	14,230
Laundry Detergents	0.0128***	0.0044	47,061	0.0193***	0.0048	38,123
Oatmeal	0.0297***	0.0107	22,934	0.0258***	0.0116	13,109
Paper Towels	0.0368***	0.0096	16,360	0.0219*	0.0112	12,920
Refrigerated Juices	0.0329***	0.0056	44,566	0.0121*	0.0067	27,465
Shampoos	0.0272***	0.0035	29,135	0.0171***	0.0065	11,861
Snack Crackers	0.0445***	0.0046	55,142	0.0231***	0.0076	23,439
Soap	0.038***	0.0064	28,658	0.0174**	0.0084	18,171
Soft Drinks	0.0539***	0.0033	86,187	0.0112***	0.0035	69,817
Toothbrushes	0.0351***	0.0056	18,109	0.0349***	0.0082	6,846
Toothpastes	0.0277***	0.0045	41,918	0.0341***	0.0083	14,924
Average	**0.0303**	**0.0056**	**51,018**	**0.0213**	**0.0075**	**29,271**

The table reports the results of category-level fixed effect regressions of the probability of a small price change. We estimate separate regressions for price increases and for price decreases. The dependent variable is "small price change," which equals 1 if a price change of product *i* in store *s* at time *t* is less or equal to 10¢, and 0 otherwise. The main independent variables are the log of average sales volume of product *i* in store *s* over the sample period and the log of the average revenue of product *i* in store *s* over the sample period. The regressions also include the following independent variables: percentage changes in the wholesale price, a dummy for sale and bounce-back prices, and a dummy for 9-ending prices, as well as fixed effects for years, months, stores, and products. We estimate separate regressions for each product category, clustering the errors by product. * $p < 10\%$, ** $p < 5\%$, *** $p < 1\%$

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