

The Impact of Lidl's Entry on Grocery Prices in Long Island, New York

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KEY TAKEAWAYS

- **In the first week of March 2020, immediately before COVID-19 pandemic affected the supply of available grocery store products , Lidl prices were substantially lower when compared to competing retailers across Long Island. (See Figure 1)**
 - Lidl's prices were 44.9% lower than specialty retailer Trader Joe's.
 - When compared to traditional supermarkets Stop & Shop and King Kullen, Lidl set prices 33.8% and 39.6% lower, respectively.
 - At Target and BJ's price differences were 18.5% and 10% respectively.
 - After making dramatic price reductions when Lidl entered the market, Costco, Aldi and Walmart had no observable price differences with Lidl.
- **All retailers decreased their prices considerably after Lidl opened new stores, compared to prices collected before Lidl entered the market. (See Figure 2.)**
 - Aldi cut its list prices by 15% and Walmart cut its list prices by 9% after Lidl's entry.
 - Stop & Shop and King Kullen decreased their prices an average of 5.3% to 3.8%, respectively.
 - Costco reacted to Lidl's entry by decreasing prices by 8.3%.
 - Target and Trader Joe's reacted by decreasing their prices by 4% each.
 - These competitive price-cutting effects were more pronounced than what is typically reported in other academic work on Walmart's entry in a new market where price decreases typically vary between 1% and 2.5 % or 5% at most. Following the entry of club stores, retail prices might even *increase*.
- **Despite a general rising trend of more than 2% in grocery prices, competing retailers on Long Island set their prices for individual products, including staples, substantially lower after Lidl's entry. (See Figure 5.)** The study showed the following price reactions across the product aisles:
 - For a higher-priced items like frozen seafood, laundry detergent and olive oils, price decreases of 15% were found.

- Price reductions of more than 10% to 15% were found in staple categories such as pasta, butter and breakfast cereals.
- For some frequently purchased goods, such as refrigerated drinks, peanut butter and frozen pizza, price reductions were 10%.

- **Lidl stepping into the void left by Best Market led to more competitive dynamic on Long Island. Following the closure of Best Market stores in Fall 2019, retailers tended to increase their prices when store competition was relaxed. (See Figure 3.) The price increases were completely wiped out once Lidl entered the market.**
 - Stop & Shop and King Kullen raised their prices about 9% and 12%, respectively, closely followed by Target and BJ's, which both increased prices up to 8%.

INTRODUCTION

U.S. households, caught in the onslaught of the COVID-19 pandemic, are facing the steepest increases in food price witnessed since the early 1970s (Gasparro and Kang 2020). The question of how supermarket competition can keep retail prices at bay is more pertinent than ever. In this study, we examine the impact of Lidl's recent entry in the Long Island, New York market on grocery and food prices.

We studied a dataset that allowed us to track price evolutions at 27 retail stores across Nassau and Suffolk counties on Long Island over the course of one year (April 2019-March 2020). We captured the changes in prices before and after Lidl started opening new stores in that market. This study builds on a similar study we completed in January 2018 [<https://www.kenan-flagler.unc.edu/news/lidl-significantly-pressures-u-s-supermarket-chains-to-cut-prices-at-unprecedented-levels>] in which we compared prices in markets in which Lidl was present versus markets in which Lidl was not present, and we found evidence that in Lidl markets prices were significantly lower.

By tracking the grocery and food price evolution among local retailers on Long Island before and after Lidl's entrance, we can assess to what extent incumbent retailers effectively changed their prices in the same store following Lidl's entry. Overall, we see that Lidl sets its prices (as recorded in the first week of March 2020) substantially below its local competitors in Long Island as is depicted in Figure 1.

In the first week of March 2020, immediately before COVID-19 induced stockpiling behavior among consumers throughout the retail industry and two weeks before a lockdown mandate was ordered in the region, Lidl set prices substantially lower when compared to traditional supermarkets, Stop & Shop and King Kullen. We found substantial price differences

in the range of 35-40%, which is in the same ballpark as what can be found at specialty retailer Trader Joe's. At Target and BJ's price differences amounted to 10% and 19%, respectively. At Costco, Aldi and Walmart, there were no significant price differences, indicating that prices are on par with Lidl. This price data allow us to glean what the market (and Lidl's price pressure) might look like in post-pandemic months as the industry is moving towards a "new normal" and the economy is slipping into a recession.

Moreover, the ensuing price pressure that Lidl's entry brought along led all competing retailers on Long Island to significantly decrease their prices between April 2019 and March 2020 by on average 4% in list prices and 5% in shelf prices. In Figure 2, we give an overview of the average prices changes that we found at the eight major chains on Long Island.

---See Figures 1 and 2 on pages 27 and 28---

The data shows Aldi and Walmart decreased their list (shelf) prices by 14.2% (14.9%) and 5.8% (8.5%), respectively. Traditional supermarkets like Stop & Shop dropped their list (shelf) prices by 3.8% (5.3%). These price cuts are all the more noticeable taking into account an inflation rate of about 2% in food prices over the same time window.

More importantly, we saw similar price reaction patterns as in the 2018 study. It was replicated here in in completely different markets, at different points in time and using a different study design, giving strong robustness to these findings. This finding adds to validity of the results in both studies and indicates that similar price reductions can be expected following future market entries by Lidl.

Background

Grocery price changes during the COVID-19 pandemic. For U.S. households, grocery and food represent one of their biggest expenses. In 2018, the average U.S. household food

expenditure amounted to approximately \$7,923US dollars. For a household with children under 18, this comes down on a weekly basis to approximately \$155 (Statista 2020). For households in the lowest income quintile, food spending even represents about 35% of their income (U.S. Department of Agriculture 2018, Singletary 2019). Moreover, an average household now pays 19.1 % more on grocery items than id 10 years ago, whereas the inflation rate was just 16.3 % (Stebbins and Stockdale 2019).

In the face of the COVID-19 pandemic, food prices rose by 2.6% in April 2020 from a month earlier, and 5.8% in the 13 weeks from March 1 to May 30 compared with the same period one year earlier. As lockdown restrictions ensued, retailers and suppliers faced new operating practices, consumer behaviors and economic outlooks. Most importantly from a pricing point of view, promotional strategies were overhauled with a notable scaling back in the short term to manage intense demand. Part of this food price rise is most likely temporary and might partially disappear as the lifting of virus-induced restrictions allow supply chains to resume their normal functions.

Over time, promotions will be gradually resumed, and utilized strategically to manage a recessionary environment. Still, prices are expected to remain at a higher levels for at least the near to medium future. Not only do most retailers and suppliers face increased costs for labor and transportation, investments made to keep consumers safe add costs that are reflected in higher consumer prices (Gasparro and Kang 2020). Saving money at the grocery store and keeping track of prices are therefore of utmost importance to most U.S. households.

The impact of store competition. One important mechanism that keeps price increases in check is store competition. Retailers compete with each other on price as they carefully monitor prices charged by competitors. They will make changes accordingly, implying that consumers

will benefit as retailers are forced to continue dropping prices and offer more convenient shopping services to compete. The extent to which they decrease prices, however, tends to differ based on the nature of the retail competition. In studies looking into the effect of Walmart Super Center entries, competitive price reductions between 1% (Basker and Noel 2009) and 2.5% (Hausman and Leibtag 2007) and 5% at most (Ailawadi et al. 2010) are typically reported. Interestingly, when it comes to the entry of club stores, Courtemanche and Carden (2014) demonstrated that store entry by Costco is associated with *higher* grocery prices, whereas Sam's Club entry does not affect grocery stores' prices. In a similar vein, Bauner and Wang (2019) reported that following a Costco entry, incumbent retailers are more likely to increase prices and reduce assortments for storable products.

In a 2018 study on the impact of Lidl entering local markets, we found that, on average, competing retailers set their prices approximately 10% lower in markets where Lidl is present compared to where Lidl is not present, whereby the magnitude of the competitive price effect was found to vary considerably by retailer and across the product aisles (Gielens 2018). Overall, these results imply that significant cost savings can be obtained for consumers in markets where new competitors enter the retail market and that these effects tend to be quite pronounced when dealing with a hard discount entrant like Lidl.

Insights from Lidl's entry on Long Island. What motivates this study? Although the academic literature widely agrees that store competition reduces price levels in local markets, less consensus exists about the extent of these price cuts. We believe it is important to gauge the robustness of the previously reported price differences. As such, we wanted to assess to what extent those price effects were influenced by the timing of the original 2018 study, the selected markets in which Lidl opened its first stores, and the design of the study.

First, the data used in the previous study were collected right after Lidl officially entered the U.S. market. During that period, the national business press reported at great length about Lidl's entry in the U.S. market and its potential for disruption. They gave various illustrations about the substantial price gaps observed between Lidl's products and its competitors right after stores opened. The substantial price effects witnessed in the previous study could therefore be partially attributed to an initial overreaction by competitors. Three years after Lidl's entry in the U.S., the question can be raised whether Lidl's presence is still considered so potentially disruptive by its competitors, leading to less pronounced price reactions.

Second, studying price reactions following a Lidl store entry in a completely different type of (more affluent) market might allow us to see to what extent the price effects generalize to a wider context. Especially as price might not necessarily be the prime differentiator among local competition in more affluent regions, observing price reactions in these type of markets could offer strong support for the initial results.

Third, in the previous study we compared prices between similar stores in markets in which Lidl was present versus where Lidl was not present. At the time, we could not assess to what extent the same store decreased prices for the same product before and after the Lidl entry. By observing prices over time, we now can explicitly capture this within-store price variation.

This study adds another interesting observation. Lidl's acquisition on Long Island allows us to assess how local competitors react to a market entry as well as to a market exit. Specifically, we can assess to what extent competitors react asymmetrically to the exit of a traditional supermarket player and the entry of a hard discount retailer. What type of retailers will be inclined to react more or less to either competitive transition? Despite the fact that the commonly shared belief would make us expect some sort of price increase following a store

closure, very little evidence exists of the extent and scope of these potential price increases (Bei, Gielens and Dekimpe 2018).

THE LONG ISLAND LIDL CASE

Since Lidl entered the U.S. market in 2017, it has opened and operates more than 100 stores in Virginia, North Carolina, South Carolina, Georgia, Maryland, Delaware, New Jersey, Pennsylvania and New York. Lidl edged into the metro New York area in late 2018 with the opening of stores in Union, New Jersey, and Staten Island, New York. Lidl is considered a hard discount retailer. Hard-discount retailers offer basic goods of daily need at the lowest possible prices, up to 30 to 50% below traditional retailers' prices, while maintaining high-quality standards (Steenkamp 2018). A hard-discount store is not to be confused with discounters like Walmart.

Hard-discount stores are about 10,000-15,000 square foot, less than one-tenth the size of a Walmart Supercenter, with comparably lower staffing levels. To reduce costs, hard discounters often display items on shipping pallets and in the boxes in which they arrive. The store is minimally decorated and offers a limited assortment of consumer-packaged goods and perishables – typically around 3,500 SKUs. In contrast, a typical U.S. supermarket sells 40,000, on average, and a Walmart supercenter sells 100,000 grocery and non-grocery items. Offering a limited assortment of products enables hard discounters to provide a high volume of basic goods and helps to streamline efficient operations. Hard discounters' costs typically add 13% or 14% to the procurement price – 2% each for logistics, rental, overhead and marketing, plus about 5% for staff. In contrast, traditional supermarkets are twice as costly on each of the cost components,

and therefore, need to add double that amount (28-30%) to their procurement prices. Private labels feature prominently in the assortment of hard discounters.

Around two-thirds of Lidl's SKUs are private label, while the share of private label at Aldi's exceeds 90 percent. Hard discounters have deep expertise on how their products are produced, who can produce them and what trade-offs they need to make. The large revenues combined with their small number of SKUs mean that the volume per SKU is very large. Aldi and Lidl, for example, are the No. 1 and No. 2 sellers of own brand grocery products worldwide. As a result, they are able to drive out every fractional cent of cost without compromising on quality.

Lidl US unveiled the acquisition of Best Market in November 2018 and thereby planted its foot squarely in the metropolitan New York market, one of the most important strategic grocery markets in the U.S. This resulted in Lidl taking over, remodeling and re-branding all Best Market's 24 Long Island stores over a three-year period. This re-branding started in mid-2019. In December 2019, Lidl opened two new stores, in West Babylon and Center Moriches, New York, and opened another in Huntington, New York, a week later. A fourth store was opened in Plainview in early 2020.

As in any other market, Lidl's local communication emphasized its price promise and strategy. For example, at time of the West Babylon Lidl's grand opening, a sign inside the entrance spelled out the savings for customers: a weekly shopping basket of \$92.79 for Lidl and \$193.32 for the former Best Market (Springer 2019). While the basket of 50-some Lidl private-brand goods vs. the brand-name counterparts available in Best Market was selected intentionally to indicate a savings of just more than \$100, it clearly indicates Lidl's determination in convincing consumers of its price promise.

STUDY DESIGN

The focus of this study is on the price evolution of individual products at competing retail stores on Long Island. We tracked prices in three waves for a basket of 47 products at multiple competing stores in the market. Below we address the selection of the timing of the three data collection waves, the locations and competing stores, and the selected products in the basket.

Time. We recorded prices in three different weeks, spread over the course of almost one year. These different data collection waves occurred during different stages in the Long Island retail market.

Data Collection Time	Description
<i>Wave One:</i> Week of April 22, 2019	In the spring of 2019, Lidl had announced the acquisition of Best Market and all Best Market stores were still open. Lidl had not yet opened any stores in Nassau and Suffolk counties.
<i>Wave Two:</i> Week of October 25, 2019	In the fall of 2019, the first set of Best Market stores closed for remodeling, resulting in a reduction of local market competition.
<i>Wave Three:</i> Week of March 5, 2020	By March 2020, Lidl had opened four stores on Long Island. The first stores had been open for about four months. This period was one week before grocery stores saw product shortages due to stockpiling behavior was observed and two weeks before the region went into lockdown in response to COVID-19.

We use the price data obtained in the first wave as a reference point to gauge whether and to what extent retailers changed their prices following changes in the local retail market structure.

Specifically, comparing the benchmark prices with the second wave data allows us to glean insight in the consequences of a reduction in supermarket competition as Best Market stores were closed. The third wave data allows us to assess the impact of the entry of a new price competitor in the local market, i.e. Lidl.

Locations and competing stores. We focused on the locations in which the first four stores Lidl opened on Long Island:

1. West Babylon, 725 Sunrise Highway (Hubbard's Commons Shopping Center)
2. Huntington Station, 711 East Jericho Turnpike (Turnpike Plaza)
3. Plainview, 1054 Old Country Road (Morton Village Shopping Center)
4. Center Moriches, 812 Montauk Highway

Table 1 provides information about the socio-economic make-up of each of the four local markets. Overall, all four markets are relatively more affluent than the average U.S. or New York market, with the median income in Huntington and Plainview being more than twice as high as in an average U.S. or New York market and about 50% higher in West Babylon and Center Moriches.

--See Table 1 on page 32---

For each new store location, we identified the set of relevant competitors. To that extent, we identified the nearest local and national retailers offering a full assortment in fresh and grocery categories, thereby making sure to cover different types of retail formats including hard discounters, club stores, supermarkets and general merchandisers¹. Specifically, we tracked stores of the following chains:

1. Aldi (2 stores)

¹ Convenience and drug stores were not covered in this analysis as we focus on full assortment grocery retail formats.

2. BJs Club (4 stores)
3. Costco (3 stores)
4. King Kullen (4 stores)
5. Stop & Shop (4 stores)
6. Target (4 stores)
7. Trader Joe's (2 Stores)
8. Walmart (4 stores)

For each Lidl location, we selected the nearest store of one of the eight competing chains.

Table 2 shows an overview of the competitive set in each of the Lidl store catchment areas.

--See Table 2 on page 33---

Whereas not all eight competitors are present in each of the four catchment areas, a minimum of five competitors can be found in the West Babylon area and a maximum of seven in the Plainview area. It is important to note that in each of the four local markets, one established price fighter was already present, as either Aldi or Walmart (or both) were operating in the market. In all four areas, the main supermarket competitors, King Kullen and Stop & Shop, were present.

On average, stores were about 5 miles removed from a focal Lidl store although some variation can be observed among the four Lidl areas. On average, competitors were between 3 and 5 miles away from the Huntington, Plainview and West Babylon Lidl store. In the Center Moriches market, competing stores are situated somewhat farther from the focal Lidl stores at an average distance of 8.4 miles.

Products. When retailers compete with prices, they typically do so to safeguard their overall price image. As consumers' overall price image typically reflects their assessment of the overall level of prices throughout a store, we selected a broad basket of 47 grocery products that

cover all different aisles and offer a fair representation of the store. In Table 3 the products are listed alongside the observed direct price differences between Lidl and its competitors as recorded in March 2020².

---Please see Table 3 on pages 34-35---

The product basket includes dairy products (milk, eggs), meats (beef, pork), produce (bananas, peppers), canned and frozen goods (canned vegetables, frozen pizza) and miscellaneous items (sugar, dishwashing detergents). The products differ widely in both price levels and price differences between Lidl and its competitors. Fresh products, like seafood, tomatoes, beef and poultry, as well as packaged goods, like frozen pizza, ice cream and bottled water, were priced significantly higher at competitor stores than at Lidl. Prices for dish detergents, coffee and butter were more or less on par. In contrast, for some (six out of 47) products such as canned seafood and lunch meats, higher prices were observed at Lidl.

Products were selected that are part of the Lidl assortment. As the Lidl products are mostly private-label products, only private labels at the rival stores were included in this study. For each Lidl item, we identified the closest resembling private-label item at the eight competitors. As the focus of this study is on studying price evolutions over time, it is important that the same (or very similar) product was available at the time of the three data collections at the different competing stores. Over a time span of almost a year, it is not unusual for grocery products to be delisted or to be temporarily not available. As a consequence, the product baskets for individual stores typically contain fewer than 47 products. On average, 28 products were available per store basket in the analysis (a minimum of 12 and a maximum of 42). In total, 780 observations were available for analyses.

² Lidl was not present in April 2019 and October 2019 in the Long Island Market. Hence price comparisons between Lidl and its competitors can only be made for the March 2020 data point.

METHOD

Data collectors were dispatched to the 27 stores covered in the study at three points in time. For all products included in the baskets that were on the shelf at the time of the data collections, prices were collected through store visits. In each store, the price recorded is the shelf price, or the lowest price available to all shoppers at the store. So for example, discounts that require obtaining coupons in advance are never factored in to prices. Promotions that do not require coupons or for which coupons are available in the store, and are redeemable on the spot, are factored in. All prices of products in the same product category were expressed in the same volume price to allow direct comparison. Using the data, we calculate two percentage price differences for each product p at store s , i.e. (1) the difference between price recorded at the second wave and the first wave and (2) the price difference between the price recorded at the third wave and the first wave. Specifically, the focal two price differences can be expressed as

$\frac{price_{p,s,w}-price_{p,s,1}}{price_{p,s,1}}$ whereby w indicates either wave 2 or 3 and we analyze their variation as

follows,

$$(1) \quad \frac{price_{p,s,w}-price_{p,s,w1}}{price_{p,s,w1}} = \sum_r^R \beta_r Retailer_r + \sum_c^C \gamma_c Catchment_Area_c + \delta Distance_s + \varepsilon_p + \mu_{p,s}$$

The parameters β_r expresses the average percentage change made by retailer r between the first wave and wave w ($w = 2$ or 3). When comparing the prices between the first and the third wave this parameter thus allows us to single to what extent a retailer changed its price before and after a structural change in the market.

As explained above, the catchment areas differ with respect to the competitive set of retailers present in the area and the socio-economic makeup of the local market. To control for

these potential sources of heterogeneity, we further include catchment market fixed-effects and we control for the distance between the competing store and the focal Lidl store in that area. To account for potential unobserved sources of heterogeneity at the product level we add a random effect ε_p . To account for the fact that error terms may be correlated across products within stores, standard errors are clustered by stores and robust errors are calculated.

To gauge to what extent the price changes are mostly driven by either chain or local market characteristics we also estimate two reduced versions of the above model. More specifically, we first estimate

$$(2) \quad \frac{price_{p,s,w} - price_{p,s,w1}}{price_{p,s,w1}} = \alpha + \varepsilon_p + \mu_{p,s}$$

Whereby α gives us an insight in the average price change over time while still correcting for unobserved heterogeneity across products and clustering of product baskets within stores.

Next, we augment the model with the catchment area and distance information

$$(3) \quad \frac{price_{p,s,w} - price_{p,s,w1}}{price_{p,s,w1}} = \sum_c \gamma_c Catchment_Area_c + \delta Distance_s + \varepsilon_p + \mu_{p,s}$$

Whereby the γ_c estimates give us an insight in the extent to which price changes in local catchment areas differ from one another. Comparing the results obtained with the parameter estimates from equation 1 also allow us to see to what extent these area differences persist once we also control for the chain-specific differences.

RESULTS

We first discuss the price evolutions between April 2019 and October 2019 before elaborating on the price changes between April 2019 and March 2020.

Price changes following the closure of Best Market stores

Table 4 summarizes the estimation results for the difference between the first and second wave prices.

---Please see Figure 3 and Table 4 on pages 29 and 36---

Key insights. Figure 3 shows the estimated results for average price increases observed at the eight competing Long Island chains after the first set of Best Market stores closed. At a glance, it depicts how especially traditional supermarkets King Kullen and Stop & Shop tend to increase their prices when store competition reduces. On average, their prices went up with 11.5% and 8.7%, respectively, followed by BJ's and Target with increases of 8.3% and 7.7%, respectively. For all other chains price increases are not statistically significant and marginal in effect, hardly surpassing the general price inflation of about 2%.

Estimation results. Between April and October 2019, local incumbent retailers *increased* their average price by almost 4% ($\alpha = .039, p < .01$). When faced with local store closures and the disappearance of a local competitor, stores are indeed inclined to increase their prices. When gauging whether these price changes vary substantially across catchment areas, we estimate the area-specific effects while also controlling for the distance between the incumbent retailer and the location where a store closed.

We find that not every area is affected equally although in each area the prices did significantly ($p=.01$) increase. The strongest increases were found in Center Moriches and Huntington. More moderate increases were observed in Plainview and West Babylon. Interestingly, we also found that the distance to closed stores matters significantly as expressed by the negative parameter of $-.009$ ($p = .01$). This means that the price increase is more

substantial at stores that are located relatively nearby to the closed store. Combined this means that for a store that is located at an average distance from the closed store, prices went up, with 4.3% in Center Moriches, 6.4% in Huntington, 2.4% in Plainview and 3.9% in West Babylon³.

After adding the chain-specific effects, we see that area-specific effects are mainly driven by retailer differences. In fact, when controlling for the differences between retailers, we find that the differences in price increases between catchments disappeared and all price changes were attributed to retailer differences. Specifically, we find that the price increases in the local markets are mainly driven by price changes at King Kullen ($\beta = .115, p < 01$), Stop & Shop ($\beta = 0.087, p < 01$), and Target ($\beta = 0.077, p < 01$). Price changes at BJs Club are borderline significant, and all price changes at other retailers are not statistically significant. Price increases are therefore mostly driven by the more traditional supermarkets that are more akin in format to Best Market.

In sum, when faced with a competitor that more closely overlaps in format and assortment, retailers are tempted to increase prices by up to 10%.

Price changes following the open of new Lidl stores

Shifts between retailers

Table 5 summarizes the estimated results for the price differences between the first and third waves of data collection. Figure 2 depicts the average price decreases for an average store per chain following Lidl's entry in the Long Island market.

³ These numbers are obtained as follows. The average distance to a location where a store was closed was respectively 8.4, 3, 4.9 and 3.9 miles. This leads to combined area and distance effects of $(-.009 * 8.4) + 0.119$ in Center Moriches, $(-.009 * 3) + 0.091$ in Huntington, $(-.009 * 4.9) + 0.068$ in Plainview and $(-.009 * 3.9) + 0.074$ in West Babylon.

---Please see Figure 2 and Table 5 on pages 28 and 37---

Key insights. After Lidl opened stores on Long Island, price fighters Aldi and Walmart decreased their shelf (list) prices by 14.2% (14.9%) and 5.8% (8.5%), respectively, closely followed by Costco which dropped prices by 5.3% (8.3%) Traditional supermarket Stop & Shop dropped its prices by 3.9% (5.3%), whereas average price drops amounted to 3.3% (5.2%) and 3.1% (4.1%) at BJ's and Target. Price reductions at King Kullen's were less pronounced at 1.4% (3.8%). Trader Joe's changes in shelf prices were not significant, but there was a significant drop in list price of 4.2%.

Estimation results. Between April 2019 and March 2020, local incumbent retailers decreased their average prices by almost 4% ($\alpha = -.040, p < .01$). When looking at differences across catchment areas, the strongest price decreases are found in West Babylon ($\gamma = -.066, p < .01$) and Center Moriches ($\gamma = -.051, p < .01$) and more modest reductions are in Huntington ($\gamma = -.012, p < .10$) and Plainview ($\gamma = -.032, p < .10$). Distance to the new Lidl store had no significant effect.

Like in the previous case, when accounting for the retailer-specific effects, the area specific differences become negligible and price decreases are squarely driven by differences between retailers. First and foremost, we notice that almost *all* retailers, with the exception of Trader Joe's, decrease their prices following Lidl's entry. This implies that regardless of their retail format, retailers react to Lidl's presence.

The most salient price decreases can be observed at Aldi ($\beta = -0.167, p < .01$) and Walmart ($\beta = -0.082, p < .01$), both positioned as price fighters and hence close competitors of Lidl. To get a better understanding of the price decrease in percentage points, we also have to factor in the average distance to the new Lidl stores, as we now know this effect is positive and significant.

This implies that at stores further removed from the new Lidl stores lower price decreases will be found. An average distance of 5 miles implies that prices decreased with 14% at Aldi and 6% at Walmart.

To put these numbers in perspective, we benchmark them with estimates found in the previous (2018) study on Lidl's price effects. When comparing markets where Lidl was present with those where Lidl was not present, Walmart's prices were on average 2% lower in Lidl markets and Aldi's prices were on average 15% lower. So, whereas Aldi's reaction is in line with what we found in a different setting, Walmart's price decreases seem more pronounced.

Given that the current study is set in a more affluent region, this might seem surprising as income could be considered an attenuating factor of price sensitivity and price competition might be less salient. Nevertheless, two elements might be at play. Whereas at the time of the previous study, Lidl's potential in the U.S. market was uncertain, Lidl's has now carved out its position in the market and is clearly set on further expansion. Not trying to fight Lidl might be myopic and potentially harmful. Also, the net present value of losing a more affluent shopper is most likely higher than losing an "average" consumer which could trigger deeper price reductions hoping to retain that valuable customer.

For the traditional supermarkets, King Kullen and Stop & Shop, the price effects amount to, respectively, -0.038 ($p < .10$) and -0.063 ($p < .01$), implying a percentage price decreases of 1.5% and 3.9% for a store located at approximately 5 miles from Lidl. Likewise, the price effects at club stores BJ's ($\beta = -0.057$, $p < .01$) and Costco ($\beta = -0.078$, $p < .01$) result in average price decreases of 3.3% and 5.3%, respectively. This is the same ballpark as what we observe at Target ($\beta = -0.056$, $p < .01$).

Shifts in list prices vs. shifts in shelf prices

In the above analyses we analyzed changes in shelf prices. These shelf prices factor in temporary price discounts. To check to what extent the above effects might be driven by these temporary price discounts, we reran the analyses using the list prices rather than the shelf prices. The effects are all in the same order of magnitude and even slightly more pronounced for the list prices, implying that these price reductions are not the artefact of a weekly price discount campaign but are more long-term in nature as list prices are set only a couple of times a year. Interestingly, when using the list prices, the price decreases at Trader Joe's also become (marginally) significant (a reduction of 4.2%), indicating that all major retailers, regardless of their retail concept do decrease prices following Lidl's entry in the market. Table 5b depicts these results.

---Please see Table 5b on page 38 ---

Differences across products

Finally, as was demonstrated in previous studies and our first Lidl white paper, retailers do not react equally strong in all product categories they carry in their assortment. Most grocery retailers carry a large number of product categories with varying degrees of vulnerability to Lidl, but little is known about how reactions might vary across these products (Ailawadi et al. 2010). Incumbents typically view staple and traffic-building categories as more important to defend (Dhar, Hoch, and Kumar 2001). Staple and/or traffic-building categories are more likely to be emphasized because these categories can drive where the consumer chooses to purchase his or her entire shopping basket, making incumbents more vulnerable in these categories. In the previous Lidl study, we found price differences between Lidl and non-Lidl markets of over 30% for important staples such as cheese, milk and bread products. Likewise, for frequently

purchased goods, such as refrigerated drinks, ice cream and water, price differences between Lidl and non-Lidl markets of more than 20% were found. Whereas it is self-evident to expect to similar variation between categories, the nature of what constitutes a staple and/or traffic driving category tends to be very specific to the local market. Local markets tend to differ in their preferences and needs. Hence, retailers adhere to micro-marketing practices and finetune their assortments to these market needs. To test for these differences in the Long Island setting, we adapt Eq. (1) as follows.

$$(4) \quad \frac{price_{p,s,3} - price_{p,s,w1}}{price_{p,s,w1}} = \sum_p^P \delta_p Products_r + \sum_c^C \gamma_c Catchment_Area_c + \delta Distance_s + \zeta_r + \mu_{p,s}$$

Whereby δ_p represents the price difference for product p before and after Lidl entered the market. Table 6 summarizes the estimation results. Overall, we find significant effects for 20 out of 47 products. Extrapolating this to the store, this would imply that throughout the store price reductions can be encountered for about forty percent of the total selection.

---Please see Figure 5 and Table 6 on pages 31 and 39-40---

Using the parameter estimates, we found price decreases for frequently purchased goods, such as refrigerated drinks, pasta and breakfast cereals, as well as for deeply penetrated and slightly more expensive categories, such as laundry detergents, oils and frozen sea foods.

CONCLUSIONS

As grocery and food expenses are becoming an ever-growing concern for many U.S. households – especially in the slipstream of the COVID-19 pandemic and the looming recession – a better understanding of how store competition impacts price levels and consumers’ welfare is all the more important. To that extent, we wanted to validate the results reported in our 2018

study that looked into retailers' price reactions to Lidl's entry in local markets. To do so, we used the case study of Lidl's entry in the Long Island market. Specifically, we tracked prices during one year for a basket of 47 products at 27 stores in Long Island.

This study indeed corroborates our earlier findings. Even in a vastly more affluent market we see that almost all retailers react to Lidl's entry by significantly reducing their prices. For price fighters Aldi and Walmart, these price reductions amount to 14% and 6%, respectively, when considering shelf prices and 15% and 8.5% when considering list prices. Especially with respect to Walmart this is a pronounced reduction which is three to four times what we observed in the previous study. Also, for more conventional super markets like Stop & Shop, price reductions are in the 3.8% and 5.3% range, for shelf and list price, respectively. Looking at the club channel, we find price decreases of up to 5.3% (shelf prices) and 8.3% (list prices) at Costco. Store competition clearly benefits consumers.

We find even more evidence for this statement by exploring the price reactions to the store closures. Whereas prices did increase significantly, these increases were mostly driven by the conventional supermarket players Stop & Shop and King Kullen, where price increases of up to 11.5% and 8.7%, respectively, could be found.

In Figure 4, we summarize the average price reactions per chain. Figure 4 clearly indicates that price increases tend to be driven mostly by traditional supermarkets and price decreases by price fighters. Lidl's presence in Long Island therefore clearly helps to keep traditional players in check and price fighters on their edge.

---Please see Figure 4 on page 30 ---

As in 2018, we see substantial variation across product aisles. We do, however, see that the actual selection of products that are prioritized are market dependent and somewhat different

from what we observed in the previous study. For the Long Island market, we find significant reductions of over 10% for about eight product categories, including frozen seafood (-17.2%), laundry detergents (-13.9%), breakfast meats (-10.23%) and oils (-15.24%). Interestingly most of these items typically tend to retail at higher price points, leading to substantial dollar gains, even in more affluent markets.

All and all, we see that store competition, and specifically Lidl's entry in local markets, keep retail prices at bay.

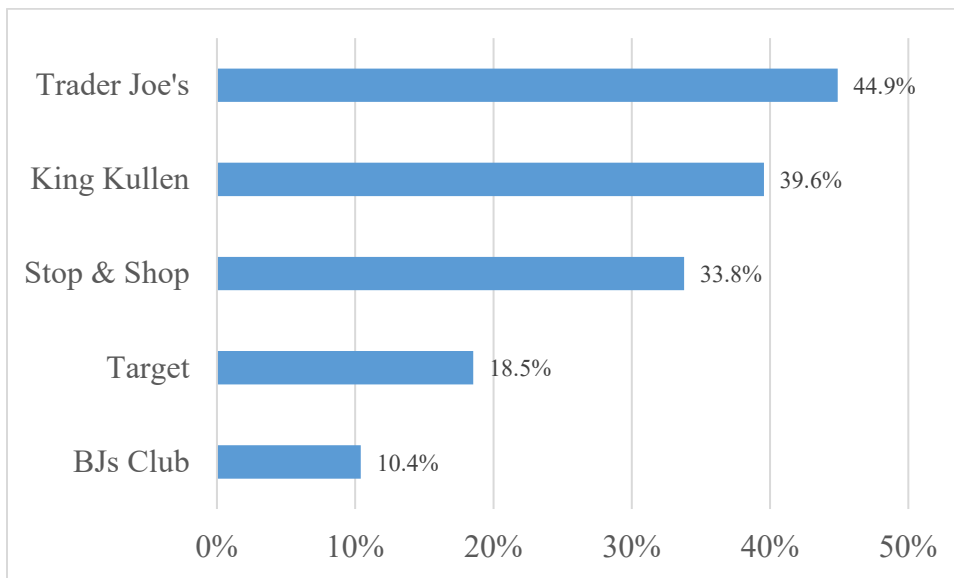
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Figure 1

The Average Price Advantage at Lidl Compared to Competing Retailers on Long Island in March 2020



*: The advantage is calculated by averaging the price differences for individual products. Specifically, we consider $(\text{price at Aldi} - \text{price at competing retailer}) / \text{price at competing retailer}$ as focal unit. Lidl's average price difference with Trader Joe's is -.449. We report this as a 44.9% price advantage.

** : Price advantages with Aldi, Costco, and Walmart were not significantly different from zero.

Figure 2

Price Changes Among Competing Retailers on Long Island Following Lidl's Entry

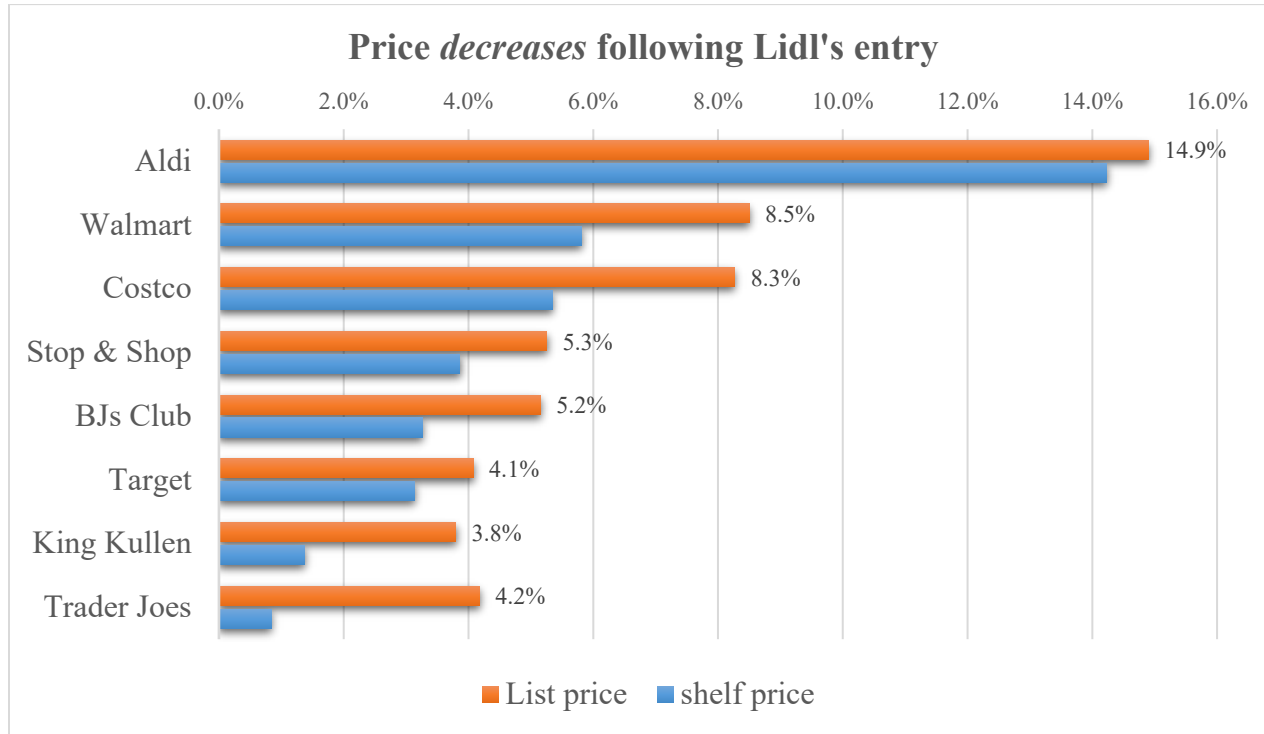


Figure 3

Price Changes in the Long Island Grocery Market Following Store Closures

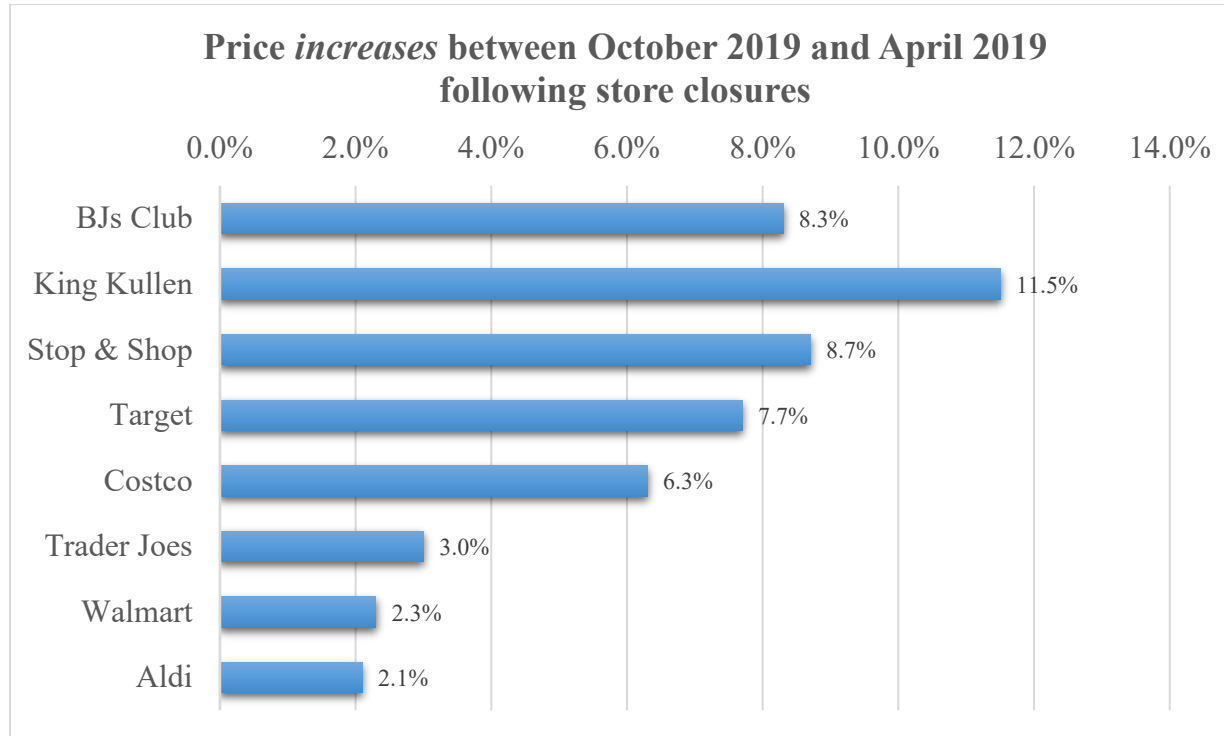


Figure 4
Comparing price increases and price decreases by chain

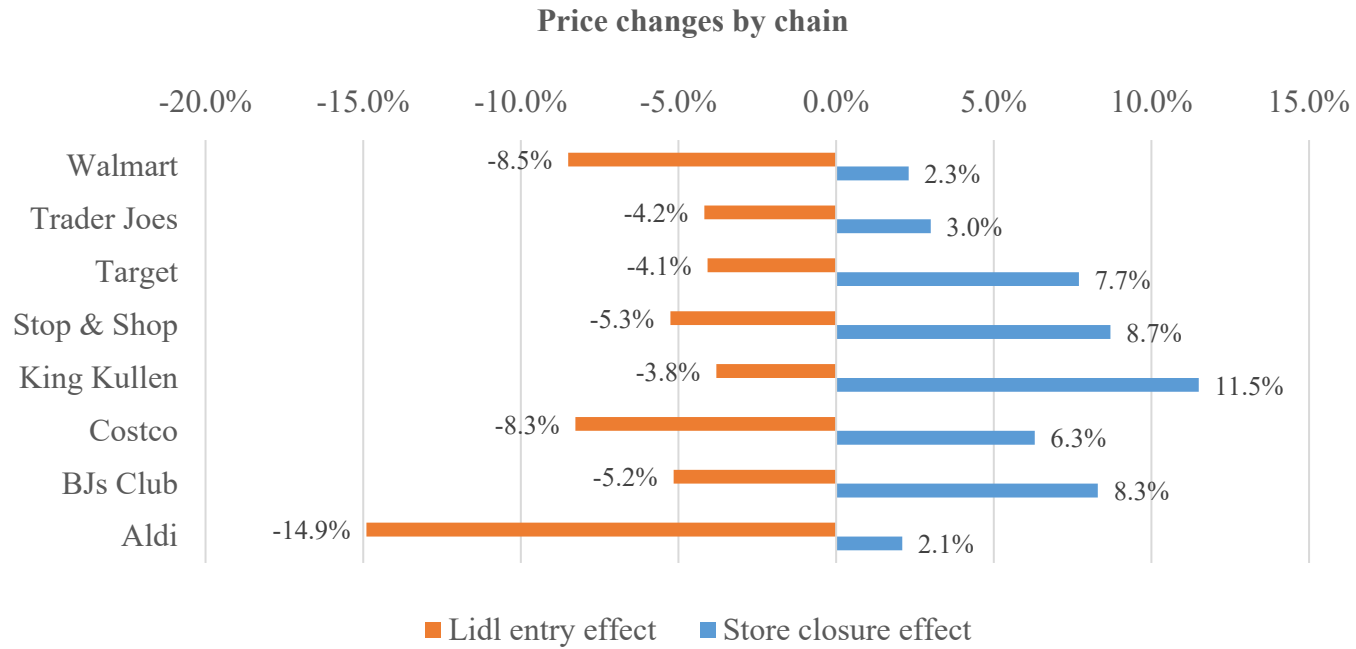


Figure 5
Product specific price reactions

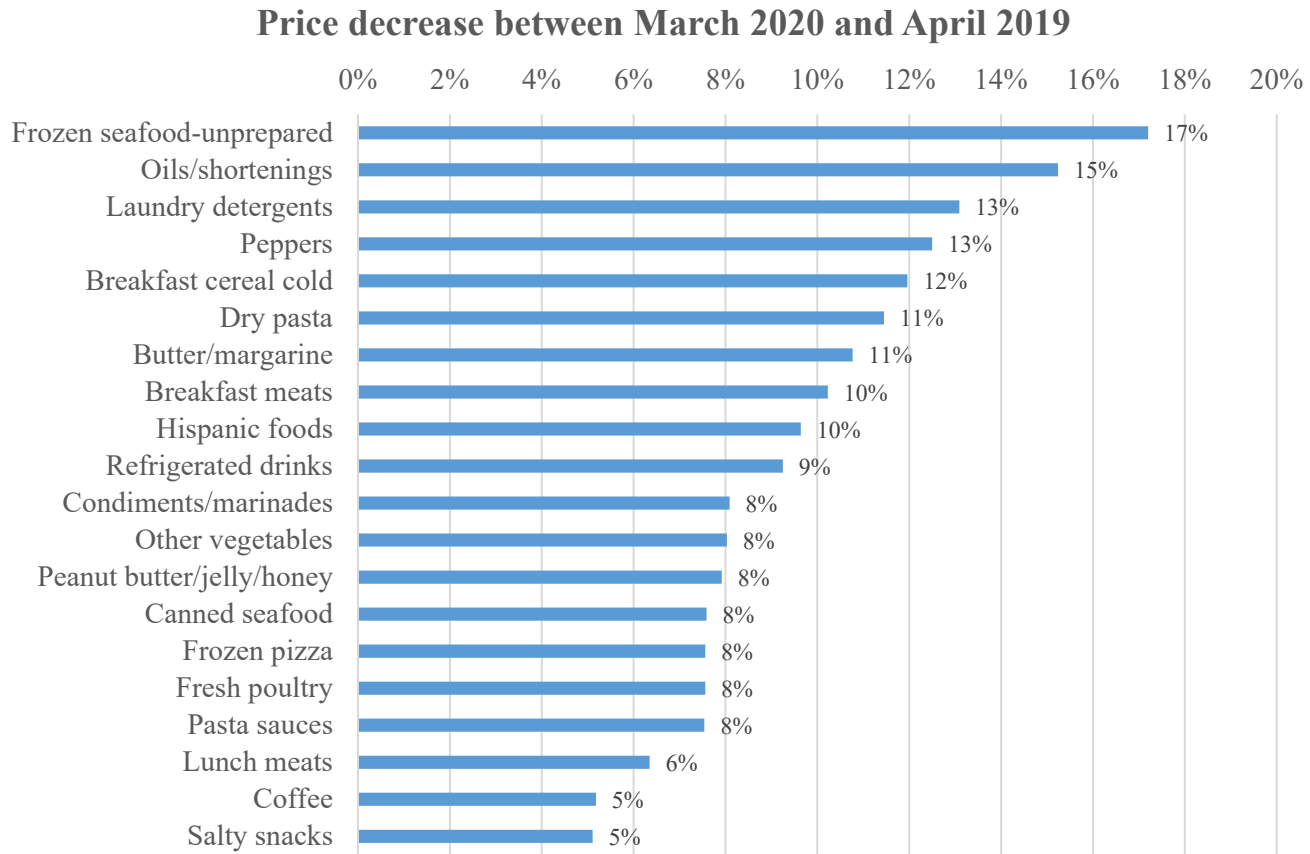


Table 1
Characteristics of the Catchment Areas

	United States	New York (state)	West Babylon	Plainview	Huntington	Center Moriches
Population, Census, April 1, 2010	308,745,538	19,378,102	43,213	26,217	18,046	7,580
Households, 2014-2018	119,730,128	7,316,537	13,351	8,913	7,053	2,753
Owner-occupied housing unit rate, 2014-2018	63.80%	53.90%	75.10%	90.80%	83.50%	83.30%
Median value of owner-occupied housing units, 2014-2018	\$204,900	\$302,200	\$348,800	\$567,200	\$598,100	\$376,900
Bachelor's degree or higher, percent of persons age 25 years+, 2014-2018	31.50%	35.90%	25.30%	64.10%	64.50%	24.30%
Median household income (in 2018 dollars), 2014-2018	\$60,293	\$65,323	\$93,420	\$143,534	\$120,475	\$91,020
Per capita income in past 12 months (in 2018 dollars), 2014-2018	\$32,621	\$37,470	\$35,976	\$61,374	\$64,320	\$39,504
Persons in poverty, percent	11.80%	13.60%	4.90%	4.30%	6.80%	2.60%

Source: United States Census Bureau

Table 2
Competitive Set in Catchment Areas

Center Moriches	Huntington	Plainview	West Babylon
Aldi			Aldi
BJs Club		BJs Club	BJs Club
	Costco	Costco	
King Kullen	King Kullen	King Kullen	King Kullen
Stop & Shop	Stop & Shop	Stop & Shop	Stop & Shop
Target	Target	Target	Target
	Trader Joes	Trader Joes	
Walmart	Walmart	Walmart	

Table 3

Product Basket

Average price average between Lidl and competing stores in March 2020

The numbers below have to be interpreted as follows. The price of soup, for example, at competing retailers is 38.6% lower at a Lidl on Long Island.

Product	Percentage price advantage
Fresh seafood	55.60%
Salty snacks	51.40%
Peanut butter/jelly/honey	50.46%
Hispanic foods	45.04%
Frozen pizza	43.17%
Buns/rolls/bagels	41.66%
Soup	38.60%
Tomatoes	35.78%
Breakfast cereal cold	35.75%
Bread	31.91%
Ice cream	30.44%
Water-still	29.21%
Condiments/marinades	27.92%
Dry pasta	25.41%
Baking needs	24.92%
Cookies	23.47%
Canned vegetables	18.89%
Fresh beef	17.90%
Pasta sauces	17.32%
Fresh poultry	17.13%
Baby diapers	16.09%

Laundry detergents	15.77%
Cheese	15.20%
Refrigerated drinks	14.07%
Fluid milk	14.02%
Soft drinks-carbonated	<i>13.73%</i>
Oils/shortenings	<i>9.76%</i>
Coffee	8.22%
Foils/wraps/bags	5.72%
Exotic fruits	<i>4.96%</i>
Dish detergents	<i>0.45%</i>
Fresh pork	0.74%
Butter/margarine	4.48%
Peppers	9.53%
Breakfast meats	-11.60%
Lunch meats	-11.72%
Canned seafood	-15.51%
Bananas	-16.50%
Other vegetables	-20.55%
<u>Frozen seafood-unprepared</u>	-25.61%

*: The advantage is calculated by averaging the percentage price differences for individual products across retailer. Specifically, we consider (price at Aldi – price at competing retailer)/price at competing retailer as focal unit. Lidl’s average price difference in the soup category is -.338. We report this as a 33.8% price advantage.

** : numbers in italics mean that there is no significant price difference with Lidl; so differences are essentially equal to zero.

Table 4
Price evolution before and after Best Market closures

	<i>Average effect</i>		<i>Area effects</i>		<i>Retailer effects</i>	
	estimate	t-value	estimate	t-value	estimate	t-value
Intercept	0.039	2.11				
<i>Retailers</i>						
Aldi					0.021	0.44
BJs Club					0.143	1.29
Costco					0.103	0.72
King Kullen					0.115	2.86
Stop & Shop					0.087	2.48
Target					0.077	1.84
Trader Joes					0.030	0.43
Walmart					0.023	0.45
<i>Distance</i>			-0.009	-2.5	-0.004	-0.77
<i>Areas</i>						
Center Moriches			0.119	2.91	0.023	0.63
Huntington			0.091	3.17	0.019	0.57
Plainview			0.068	2.24	-0.005	-0.15
West Babylon			0.074	2.37	0.000	.
Random product effect	Y		Y		Y	
Clustering In Store	Y		Y		Y	

Table 5
Price evolution before and after Lidl Entry

	<i>Average effect</i>		<i>Area effects</i>		<i>Retailer effects</i>	
	estimate	t-value	estimate	t-value	estimate	t-value
Intercept	-0.04	-3.67				
<i>Retailers</i>						
Aldi					-0.167	-5.02
BJs Club					-0.057	-1.69
Costco					-0.078	-1.89
King Kullen					-0.038	-1.32
Stop & Shop					-0.063	-2.54
Target					-0.056	-1.89
Trader Joes					-0.033	-0.8
Walmart					-0.082	-2.43
<i>Distance</i>			0.000	-2.5	0.005	1.74
<i>Areas</i>						
Center Moriches			-0.051	2.91	-0.010	-0.4
Huntington			-0.012	3.17	0.030	1.23
Plainview			-0.032	2.24	0.007	0.33
West Babylon			-0.066	2.37	0.000	.
Random product effect	Y		Y		Y	
Clustering In Store	Y		Y		Y	

Table 5b
Price evolution before and after Lidl Entry
List Price vs. Shelf Price

	<i>Shelf Price</i>		<i>List Price</i>	
	estimate	t-value	estimate	t-value
<i>Retailers</i>				
Aldi	-0.167	-5.02	-0.167	-5.06
BJs Club	-0.057	-1.69	-0.069	-2.08
Costco	-0.078	-1.89	-0.101	-2.46
King Kullen	-0.038	-1.32	-0.056	-2.06
Stop & Shop	-0.063	-2.54	-0.070	-2.85
Target	-0.056	-1.89	-0.059	-2
Trader Joes	-0.033	-0.8	-0.060	-1.47
Walmart	-0.082	-2.43	-0.103	-3.06
<i>Distance</i>	0.005	1.74	0.004	1.1
<i>Areas</i>				
Center Moriches	-0.010	-0.4	0.010	0.4
Huntington	0.030	1.23	0.061	2.49
Plainview	0.007	0.33	0.039	1.75
West Babylon	0.000	.	0.000	.
Random product effect	Y		Y	
Clustering In Store	Y		Y	

Table 6**Product specific price evolution before and after Lidl entry**

Product Category	Average price decrease following Lidl's entry
Frozen seafood-unprepared	-17.20%
Oils/shortenings	-15.24%
Laundry detergents	-13.09%
Peppers	-12.50%
Breakfast cereal cold	-11.96%
Dry pasta	-11.45%
Butter/margarine	-10.77%
Breakfast meats	-10.23%
Hispanic foods	-9.64%
Refrigerated drinks	-9.25%
Condiments/marinades	-8.09%
Other vegetables	-8.03%
Peanut butter/jelly/honey	-7.92%
Canned seafood	-7.59%
Fresh poultry	-7.56%
Frozen pizza	-7.56%
Pasta sauces	-7.54%
Lunch meats	-6.35%
Coffee	-5.18%
Salty snacks	-5.11%
Soft drinks-carbonated	-4.13%
Foils/wraps/bags	-3.65%
Tomatoes	-2.07%
Exotic fruits	-1.87%
Bread	-1.59%
Fresh pork	-1.32%
Cookies	-0.94%
Water-still	-0.74%

Dish detergents	<i>-0.74%</i>
Fluid milk	<i>-0.72%</i>
Baby diapers	<i>-0.46%</i>
Eggs	<i>0.36%</i>
Bananas	<i>0.84%</i>
Ice cream	<i>1.97%</i>
Fresh seafood	<i>3.53%</i>
Buns/rolls/bagels	<i>4.27%</i>
Baking needs	<i>5.00%</i>
Canned vegetables	<i>8.38%</i>
Cheese	15.31%
Soup	19.57%

*: Numbers in italics are not statistically different from zero; so basically equal to zero. Estimates are translated to percentage price differences.

** : These differences are estimated while taking into account differences between chains and catchment areas around Lidl Stores; we also take into account that changes will be correlated within a competitor store.