Impacts from a retail grocery acquisition: Do national and store brand prices respond differently?

William Secor, Dept of Agricultural & Applied Economics, Virginia Tech, wsecor@vt.edu

Metin Çakır, Dept of Applied Economics, University of Minnesota, mcakir@umn.edu

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Abstract

We investigate the extent to which a grocery retailer merger has different effects on the prices of national and store brands. Using retail scanner data, we retrospectively analyze a food retail acquisition in a large United States city. We focus on fluid milk and ready-to-eat cereal categories, which represent a relatively homogenous and a relatively differentiated product category, respectively. We use a difference-in-difference estimation framework to obtain the causal effect of the acquisition on prices for the acquiring retailer. Our findings provide evidence that store brands in differentiated product categories could allow a retailer to improve its market power.

Keywords: Merger and acquisition, grocery retail, store brands, market power, difference-in-difference
JEL Codes: L11, L13, L22, L81

The food retailing industries in the European Union and the United States are marked with increasing concentration over the past two decades. In the U.S., the industry's national four firm market concentration ratio was 36.4% in 2013, up from 16.8% in 1993 (U.S. Department of Agriculture Economic Research Service, 2014). Consolidation through mergers and acquisitions in the industry in recent years has been an important factor contributing to the increased concentration. Concurrently, the industry has observed a steady growth of store brand (SB) products (also known as private labels) in consumers' food budgets.[i] Recent trends reported by the Private Label Manufacturer Association show that sales of SBs have grown at an annual rate of more than 4% since 2012. Meanwhile, average growth for national brands (NB) was at 2%. As for total expenditures, in 2014, U.S. consumers spent about $62.1 billion on SBs in supermarkets, comprising 19.5% of the dollar share of total supermarket sales.

The two trends—of increasing concentration in the retail food industry and the steady growth of SB products in consumers' food budgets—are tightly linked. The increasing retailer concentration raises concerns about retailers' market power exertion in local markets. It also adds to the growth of SBs in many food categories through the retailer's expanded market presence. The growth of SBs can cause opposing effects on product and retailer competition. On the one hand, SB growth could raise brand level competition due to increased variety and their generally low prices. On the other hand, SB growth could further add to the increasing industry concentration and retailer market power. It could add to industry concentration if small and medium size NBs cannot compete with SBs for shelf space and exit the market. Also, because SBs are owned and exclusively marketed by a retailer they could be used as an instrument to exert market power. However, the extant literature on the effects of SB growth on prices and welfare does not account for the interplay between increasing grocery retailer concentration and the growth of SBs. In this article, we address the issue by investigating whether increased grocery retailer concentration has differential effects on prices of NB and SB food products.

Specifically, we ask the following question: how do SB prices change in a product category relative to those of NBs after a merger or acquisition? To answer the question we analyze retrospectively a food retail acquisition in a large United States city in 2012. An important feature of the acquisition is that the acquired retailer only had stores in the metropolitan area and sold most of its stores to the acquiring firm. We exploit this feature to causally identify the effects of acquisition on the acquiring retailers' prices. We use store scanner data that includes quantity and price information at the Universal Product Code (UPC) level. We focus on two product categories – fluid milk and Ready-to-Eat (RTE) cereal. These categories are selected because they are typical examples of high volume, fast-moving products. Also, they represent different competitive environments. The RTE cereal market is dominated by NBs and is highly differentiated. In contrast, SBs dominate the fluid milk market and the products are relatively homogeneous.

Our findings are as follows. First, we find that average prices decreased around 0.3% for fluid milk and 0.6% for RTE cereal per unit because of the acquisition. The overall decrease in average prices indicates that either the acquiring firm achieved significant cost savings that outweigh portfolio effects or the local, retailer competition intensified due to the acquisition, or a combination of both. Second, we investigate the break out of the overall acquisition effect by NB and SB products in the two product categories. For milk, the results did not show any statistically significant difference between changes in NB and SB prices; the acquiring firm reduced prices across the board for all brands. The cereal category is a different story: results show that the NB prices decreased by approximately 1% with no significant changes in the prices of the SBs.

These results provide evidence that the SBs in differentiated product categories could allow retailers to improve their market power. We do not find such evidence in the fluid milk category, which is composed of relatively homogeneous products. Furthermore, the results show that if aggregate price changes were analyzed, the overall cost savings due to the acquisition would have masked this market power effect. In general, because SBs are vertically integrated competitors the potential effects of their growth on prices should be accounted for in analyses of grocery retailer mergers and acquisitions.

The rest of the paper is organized as follows. The next section reviews the related literature. The third section provides a theoretical framework for price changes after a food retail merger or acquisition. The fourth section describes the acquisition under study. The subsequent two sections present the empirical framework and introduce the data, respectively. The next section discusses the results and their implications and the last section concludes.

Related Literature

This article builds on bodies of work on SBs and horizontal mergers. Early research on SBs examined why they are sold and the conditions under which they succeed. Some notable findings are that retailers own SBs to differentiate their stores from others (Cortsjens and Lal, 2000) and improve their bargaining position for procurement of NBs (Narasimhan and Wilcox, 1998). Another important reason why retailers sell SBs is to obtain some of the profit potential from the vertical chain that is unavailable due to double marginalization[ii] (Mills, 1995). Although SBs are prevalent, their success varies greatly across all grocery categories. SBs gain more market share in categories that are large and have high margins, fewer manufacturers, less advertising, and higher quality SBs (Hoch and Banerji, 1993).

Next, strategic interactions and competition between SBs and NBs is explored. A strand of this literature focuses on the impact of SB presence on market price, firms' profits, and consumer welfare. An early study by Putsis (1997) finds that NB prices decrease as SBs increase. This finding is later supported by the findings of Cohen and Cotterill (2011) and Cotterill and Putsis (2000). Using structural simulation analysis, Cohen and Cotterill find that prices decrease when SBs are introduced. In contrast to these studies, Ward, et al. (2002) and Bontemps, Orozco, and Requillart (2008) find that NB prices actually increase with increasing market share of SBs.

Empirical evidence on how SB growth affects market prices is mixed. A limitation of the previous research is that it overlooks the effects of the growth of SBs on key elements of market structure such as retailer concentration and the size of entry barriers in product markets. For example, in the short run, SB growth could raise brand level competition due to increased variety and their generally low prices. However, in the long run, the development of SBs could have anticompetitive effects if small and medium size NBs cannot compete with SBs for shelf space in retailer stores and exit the market.

Horizontal Mergers Literature

Although the empirical literature on the effects of horizontal mergers on market prices is large, only a few studies analyzed mergers retrospectively in the food-retailing sector. An early example of merger analysis in food retailing saw Smith (2004) use an ex-ante, structural approach to simulate the effect of various mergers in the British retail grocery industry. The author finds that mergers increase retail prices in all cases and that the degree of price increase varies by location, indicating the very regional and local nature of retail grocery competition.

In a recent study, Hosken, Olson, and Smith (2012) use an ex-post reduced-form analysis to estimate the effects of several mergers in major U.S. metropolitan areas using market level price indices. The study finds that mergers in already concentrated markets increase prices, while mergers in less concentrated markets decrease prices or have no effect. Similarly, Davis (2010) measures price changes around several mergers using firm-level scanner data from 1997-1999 and finds that NB and SB prices increase by approximately 4% and 6% on average, respectively. In a closely related study, Allain et al. (2013) measure price changes after a nationwide merger between two French food retailers using a difference-in-difference method with household purchase data. They find that the merger is positively correlated with the merging firms' prices, and has significantly increased competitors' prices.

The literature on grocery retailer mergers is thin. We do not know enough about the economic consequences of grocery retailer mergers, and their differential effects on product or consumer types. Furthermore, vertical integration in grocery retailing is common, however the current ex-post food retail merger research has not taken this important aspect into account. Research on mergers in other industries shows that vertical relationships play an important role in affecting retail prices. For example in gasoline sector, Hastings (2004) finds that increasing the presence of vertically integrated, branded gas stations increases gas prices. Similarly, Houde (2012) finds that prices increase after a merger in the Quebec City gasoline market that increased the number of vertically integrated stations.

In this article we contribute to the literature by investigating the differential effects of a grocery retailer acquisition on NB and SB product prices. The results of this analysis shed new light on retailers' relative pricing strategies of NB and SB, and improve our understanding of how the interplay between retailer concentration and the growth of store brands affects prices. In our empirical work, we use store scanner data to analyze retrospectively a food retail acquisition in a large United States city in 2012. We perform a difference-in-differences analysis to measure the effects of the acquisition on the acquiring retailer's prices. In the analysis, we carefully specify the treatment and control groups and account for many unobserved, potentially confounding factors. A novel aspect of our analysis is that the unique nature of the acquisition allows us to causally identify the effects of the acquisition on the acquiring retailer prices. Whereas, previous studies analyzing a nationwide merger were able to causally identify the effects only on the competing retailer prices or overall food retail prices in affected markets.

Food Retail Merger Framework

In theory, the effect of a merger on prices is ambiguous due to two opposing factors. For concreteness, consider a merger between two close competitors in a differentiated product market. On the one hand, after the merger the new firm would be able to set prices by taking into account the substitution effect between products of the merged firms.[iii] A firm's internalization of substitution effects in its optimal pricing decision is often called the portfolio effect. The portfolio effect results in reduced competition between the products and puts an upward pressure on product prices. On the other hand, mitigating or even overriding the portfolio effect is the second factor of lower costs through efficiencies of scale and scope that may materialize in the larger, merged firm.[iv] These lower costs are passed through to the consumer to some degree. If costs decrease sufficiently, product prices may actually decrease after a merger.

The portfolio effect and cost gains due to a grocery retailer merger can be different for NB and SB products. In a grocery retailer merger, the merged firm controls more stores ex-post, hence the portfolio effect is composed of internalization of substitution effects between stores and between products within stores. If the substitution effects between NBs and SBs are not symmetric, the portfolio effect on NB and SB prices will be different. Empirical evidence supports non-symmetry of substitution effects, showing that NB prices are not very responsive to price changes of SBs, however the opposite is true for SB prices responding to NB price changes (Cotterill, Putsis, and Dhar 2000; Çakır and Balagtas 2014).

Efficiency gains through economies of scale or scope or through a better bargaining position with suppliers may also accrue to the retailer across NBs and SBs differently. Some efficiency gains likely accrue to the retailer evenly across brands. These include efficiencies in headquarter functions such as accounting, human resources, and advertising. However, due to vertically integrated nature of SBs other sources of efficiency gains; such as scale economies in purchasing, production, or distribution, may accrue to NBs and SBs to different degrees.

The differential effect of a merger on SB and NB prices would imply different relative magnitude of the economic forces at play for each product. For example, if NB and SB prices both decrease (increase) due to a merger, this would imply that average cost savings that are passed into consumer prices are larger (smaller) than the average portfolio effect. Next, suppose that the difference between the change in NB prices (ΔP_{NB}) and the change in SB prices (ΔP_{SB}) is negative (positive) (i.e., $\Delta P_{NB} - \Delta P_{SB} < 0 (> 0)$). There are two cases that may cause this difference. First, it might be the case that SB portfolio effect is larger (smaller) than that of NB. This case would imply that retailer market power exerted on SBs (NBs) has relatively increased. Alternatively, the difference might be due to relatively larger (smaller) cost savings on the NB products that are passed into consumer prices than those of savings on the SB products.

Acquisition Background

We analyze a food retail acquisition that took place in one of the ten largest U.S. metropolitan areas in 2012.[v] Notably, in this metropolitan area (MA) the grocery retail market is very fragmented with several national and regional chains. Before the acquisition in 2011, the market leader had less than 20% market share, followed by the runner-up with less than 15% market share and the other three top five market share leaders each with less than 10% market share. In addition to these large chains, smaller grocery stores serving only the MA had a significant share of the market (Metro Market Studies 2012). By 2013, after the acquisition, the market share leader runner-up in 2011 became the market leader with still under 20% of the market share, followed by the 2011 leader less than a percentage point behind (Metro Market Studies 2014). Most regional and national retailers that serve the MA market vary prices by location which reflects spatial differences in demand and costs.

In 2012, a large, regional supermarket chain (RA) announced it was acquiring approximately 60% of the stores from a small, local supermarket chain (RB) that served only the MA market. In 2011, RA had nearly a quarter of its stores that were located in the state in the MA market. Later in 2012, RA completed the purchase of all but one of the stores and reopened them that same month. These stores were rebranded under the RA brand. Of the remaining RB stores, most were sold to minor chains and the rest were closed.

Before the acquisition, RA and RB pursued different pricing strategies with RB prices typically higher. However, both retailers followed similar macro-shifts and trends, such as higher milk and food prices during the 2008-2009 recession, across the time period of study. The acquisition did not greatly change the concentration of the top 4 firms during the period of study. However, the acquisition represents a large number of stores for a single retailer in a single market. RA increased the number of its stores in the MA market by more than a 25% with the acquisition.

Empirical Strategy

A naïve approach to measure price changes for NB and SB products due to RA acquiring RB is to measure the average difference in the prices for RA stores in the MA before and after the acquisition. However, this assumes that the counterfactual price change is zero, which is unlikely to be accurate as prices may also change due to other factors that affect demand or supply conditions in the market. We construct a more plausible counterfactual by using price changes in a similar market that is unaffected from the acquisition to account for changes in the economic environment. This approach is commonly referred to as the difference-in-difference (DID) identification strategy.

There are a number of advantages in using the DID identification strategy to study the acquisition in the MA market. First, the only major change occurring in the MA grocery market during the study is the acquisition, which suggests, to the extent that they exist, the confounding effects of other changes in the MA market are potentially small. For example, no other major shocks to the competitive environment such as entry by a new store or an exit are observed. Additionally, the geographic price variation allows for the use of price changes in other locations as counterfactual to price changes in the MA. By using the DID identification strategy and controlling for other market factors that may be changing between the MA and non-MA markets in the same state and before and after the acquisition, the analysis obtains a causal estimate of NB and SB price changes due to the acquisition.

In general, the DID identification strategy begins with a treatment, observations before and after treatment, and groups that received and did not receive the treatment. In the case of this study, the treatment is the acquisition (T), the observations before the treatment are prices for product j at store i before the acquisition (p_{ij0}), and the observations after the treatment are prices for product j at store i after the acquisition (p_{ij1}). For the basic DID estimate, the treatment group consists of stores in a market that was affected by the acquisition ($T = 1$), and the control group consists of stores in nearby markets that were not affected by the acquisition ($T = 0$). The pure DID estimate of the effect of the acquisition is the following:

(1) $$E\left[p_{ij1} - p_{ij0} \middle| T = 1\right] - E\left[p_{ij1} - p_{ij0} \middle| T = 0\right].$$

The practical delineation of stores into treatment and control groups is important for ensuring that the control group is a good representation of the treatment group's counterfactual. The treatment group should include all stores that were affected, directly or indirectly, from the acquisition. The control group should include only those stores that are not affected by the acquisition.

A conceptual division of the net price effects from a food retailer acquisition by market can be useful in determining appropriate treatment and control groups for empirical work. An acquisition can have within market effects and across market spillovers. The within market effects are felt by the stores in the markets where the acquisition occurred. There are direct within market effects that affect the acquiring firm's stores, and there are indirect within market effects that affect competing firms' stores. The across market spillovers are benefits and costs accruing to retailers' stores in other markets because they compete with the acquiring retailer. In the MA acquisition case, direct acquisition effects are felt by RA stores in the MA. Stores in the MA competing with RA experience indirect acquisition effects. RA stores and other retailers' stores not in the MA may experience across market spillovers.

The following is an example to provide concreteness to the above discussion. Suppose there are four retailers, retailers A, B, C, and D, and two markets, market 1 and 2. Suppose, as is the case in this study, retailer A acquires retailer B. Furthermore, suppose retailer B has stores only in market 1 and retailer A has stores in markets 1 and 2. Additionally, suppose retailer C has stores in market 1 and 2, and retailer D has stores only in market 2. Then, retailer A is the only retailer to experience direct within market effects. Retailer C is the only retailer to experience indirect within market effects. Retailer A and retailer C also experience across market spillovers because they are the acquiring store and compete with the acquiring store in market 1, respectively. Finally, retailer D experiences across market spillovers also because it competes with retailers A and C only in market 2.

These conceptual effects delineate treatment from control groups by illustrating which stores may be affected by the acquisition. In general, all of these effects may be non-zero. However, different acquisitions and mergers have different magnitudes on each of the effects. The acquisition under study is isolated geographically and is relatively small compared to the overall size of the retailer and the national market. These characteristics of the acquisition imply that across market spillovers will be very small if present. Hence, in the baseline analysis we assume that the across market spillovers are zero. Accordingly, we define the treatment group as the RA stores in the MA, and the control group as the RA stores not in the MA.[vi] [vii]

Market Definition

Market definitions are a combination of the county and the Nielsen market delineation. Specifically, the MA market is defined as the Nielsen MA market. Other food retail merger studies have used similar, traditional market level definitions (Hosken, Olson, and Smith 2012). To define the non-MA market for control group, first we draw a one county buffer around each county in the Nielsen MA market, and then define all other counties in the same state as the non-MA market. We use a one-county buffer because the Nielsen dataset reports store location at the county level, which does not reveal how geographically close two stores are to one another. A store that is located in an adjacent non-MA county might be competing with stores in MA. In this case, the store in the non-MA county should not be included in the control group. Therefore, we conservatively use a one-county buffer between the MA and non-MA counties.[viii]

Empirical Model and Treatment Effects

In the pure DID identification strategy an important assumption is that the assignment to treatment, being a store in the MA, is uncorrelated with price changes. This assumption is tenuous for the case of retail acquisitions if store locations are determined based on current and expected local demand and other market factors. For example, stores located in rural areas may provide a different product-price mix over time than stores in urban areas. In other words, the acquisition decision can be based on the location characteristics. To account for this endogenous acquisition decision we use a regression DID model which includes store, product, and market characteristics in the analysis to control for the differences between locations.

Specifically, the control variables are product-store-quarter fixed effects and time-varying, county-level market characteristics. Product-store fixed effects control for time-invariant product and store characteristics such as product loyalty and store location. Adding quarter fixed effects controls for time-variant product and store characteristics in addition to time-invariant characteristics. Time-variant product characteristics include recipe or quality changes and time-variant store characteristics include store expansions, renovations, or changes in services (e.g., deli counters, wine advisor, etc.). Time-variant county characteristics such as per-capita income and population are included to control for changes in market demand and the number of food stores to control for changes in competition.[ix]

We seek to obtain average treatment effects of the acquisition (acquisition effects) for NB and SB products as well as the overall acquisition effects on a product category in RA stores. To this end, we first estimate the following equation:

(2) $$\ln(P_{ijt}) = \alpha + \beta A_t + \gamma(A_t \times SB_j) + \delta_1(A_t \times T_i) + \delta_2(A_t \times T_i \times SB_j) + \theta' X_{it} + \sum_{k=1}^{K=i\times j\times t} \lambda_k Z_{ijt} + \varepsilon_{ijt}.$$

where $\ln(P_{ijt})$ is the natural log price for product j at store i in time period t, SB_j equals 1 if product j is a SB and 0 if not, T_i equals 1 if store i is in the MA and 0 if not, and A_t equals 1 if the observation is after the acquisition period and 0 otherwise. The term $\boldsymbol{X_{it}}$ is a vector of market characteristics for store i, Z_{ijt} are product-quarter-store fixed effects, and ε_{ijt} is the error term that is assumed to be normally distributed. The terms, $\boldsymbol{X_{it}}$ and Z_{ijt} are used to control for market characteristics, and product and store characteristics that may change overtime.

The parameter β measures the average change in NB prices after the acquisition in RA stores outside the MA. Similarly, γ measures the difference in the average change in prices after the acquisition between NBs and SBs in RA stores outside the MA. The estimates of acquisition effects are obtained from δ_k $(k = 1,2)$. The acquisition effect on NB prices (ΔP_{NB}) is measured by parameter δ_1 because NBs are the reference group for the SB_j dummy variable. The difference in SB and NB acquisition effects is measured by parameter δ_2. Therefore, the acquisition effect on SB prices (ΔP_{PL}) is obtained by summing parameters δ_1 and δ_2.

The overall acquisition effect is the weighted average of δ_1 and $\delta_1 + \delta_2$ with the weights being the share of NB price-week observations and SB price-week observations, respectively. This estimate is obtained by running the following regression:

(3) $$\ln(P_{ijt}) = \alpha + \beta A_t + \delta(A_t \times T_i) + \theta' X_{it} + \sum_{k=1}^{K=i\times j\times t} \lambda_k Z_{ijt} + \varepsilon_{ijt}.$$

The estimate of the overall acquisition effect is δ.

Testing the Significance and Equivalence of Relative Price Changes

We perform tests on δ, δ_1, and $\delta_1 + \delta_2$ to determine if the overall, NB, and SB acquisition effects are significant, respectively. The theoretical framework provides no clear predictions of the treatment effects' qualitative signs. To determine if NB and SB prices change differently we test if δ_2 is significantly different from zero. Here again, the theory does not provide any predictions a priori about the results from this test.

Table 1 presents description of empirical tests performed on interaction parameters and the corresponding insights they reveal. In the table, the first two sets of tests determine if the acquisition had a significant impact on prices in RA stores in the MA. The first set determines if it had any effect on NBs or SBs individually, while the second test determines if it had an overall impact on prices. The third test determines if NB and SB prices changed differently. For concreteness, consider the following example. Let $\delta_1 < 0$, $\delta_2 > 0$, and $\delta_1 + \delta_2 > 0$. This means that $\Delta P_{PL} > 0 > \Delta P_{NB}$ in RA stores in the MA.

Data

Our data comes from two sources. We use Nielsen store scanner data to analyze product-level price changes.[x] The data include information on weekly price and sales at the Universal Product Code (UPC) level from a panel of stores across the United States during 2009-2013. Each store has a store code that remains constant across time and a parent code tracking which retailer owns the store. A change in a store's parent code indicates an acquisition or merger. Also, the dataset provides information on a store's location at the county level. Therefore, we match the store scanner data with the U.S. Bureau of Economic Analysis (BEA) data to describe the market conditions for each store. We use variables such as per capita income, total population, and total income by county from the BEA data.

We perform a number of tasks to prepare the data for estimation. To start, we identify identical products in two different stores by matching UPCs. However, to maintain anonymity of the retailer, UPCs of all SBs are assigned the same code. To overcome this limitation, we link SBs to a store's parent code because SBs are sold exclusively by the owner retailer. By making this link, we are able to measure price differences between SBs in a product category across stores for the same retailer.

Next, to maintain a consistent and representative sample across time, products with infrequent observations are removed. Specifically, we only include UPCs that have sales in every month. This is important because the DID method requires price observations for the same UPC-store combination before and after the acquisition. Moreover, this ensures that the results are not driven by outliers and unpopular products. Also, in order to have a balanced dataset, the final dataset includes the same number of months before and after the acquired stores reopen. Finally, to maintain a consistent sample across the treatment and control groups, we remove the products that are not sold in both the treatment and control areas. This ensures that only those products that are directly comparable across groups are included.

Leading up to the stores changing ownership, RA and RB store prices may change in ways that would bias the true acquisition effect. These are anticipation effects. These include RB reducing prices on products to clear inventory before the stores are officially sold. Alternatively, RA stores may reduce prices after negotiations to indicate to anti-trust regulators that the acquisition will not negatively affect consumers. The anticipation effects would distort the price difference before the acquisition and bias the acquisition effect estimates from the DID analysis. In order to keep the data clean from anticipation effects, we remove observations leading up to the acquisition. Also, to ensure transition effects after the acquisition are not included, we drop observations immediately after the RB stores reopen.

To account for anticipation and transition effects we repeat the empirical analyses with four alternative buffer windows that exclude observations within two-month, four-month, six-month, and eight-month of data around the timing of the acquisition, respectively. The timing of the acquisition is the month in which the acquired stores are closed and reopened. These buffer windows leave approximately a year of data after the merger, so these acquisition effects are short-term effects. This means that other long-run structural changes that occur in the market will not confound the estimates

Estimation Data

In our analysis, we focus on two product categories – fluid milk and RTE cereal. These products are selected because they are typical examples of high volume, fast-moving product categories, and are well studied in the literature.[xi] Also, the product markets exhibit different competitive structures. For example, milk is a relatively homogeneous product with SBs having a majority of sales. In contrast, RTE cereal is dominated by NBs and is a highly differentiated product.[xii]

The key identifying assumption of the DID approach is that the price trends for the treatment and control groups would have been the same in the absence of the acquisition. This assumption implies that a common price trend exists in the pre-acquisition period for the treatment and control groups. Figure 1 contains graphs for weighted average milk and RTE cereal prices (weighted by sales) by market (the MA or non-MA) and brand type (NB and SB). Data from the acquisition buffer period has been excluded. The straight line links the last pre-acquisition price before the buffer to the first post-acquisition price after the buffer. The figure shows that NB and SB milk prices track each other closely between the MA and non-MA stores.

Also, there is much more volatility after the acquisition in SB milk prices in the MA. For RTE cereal, both NB and SB prices seem to follow each other well across markets. However, RTE cereal prices are more volatile than milk prices. This may be due to more promotions being run on these products or because milk is more of a commodity. Overall, price trends follow each other closely across the MA and non-MA for both products in the pre-acquisition time period. These trends provide strong evidence that the common trend assumption holds.

Tables 2 and 3 contain summary statistics of data with an 8-month acquisition and one-county buffer for milk and RTE cereal, respectively. In the top panel, summary statistics for all stores, just the treated stores, and just the control stores are presented in the first three columns, respectively.[xiii] The county characteristics, summarized in the first three statistics, are the same across both tables. The statistics show that the average treated county has a much larger population, higher per capita income, and more food stores. This is expected because the treated counties are around the MA metropolitan area. It also clearly shows that the county characteristics should be included in the econometric model because they display variation across time and treatment status. Note that there are similar shares of observations across treatment and control with slightly more data coming from treated areas.

A close inspection of table 2 reveals a number of important aspects of the milk category. The sample includes 85 products with just fewer than 30 million units being sold totaling nearly $86 million in sales. A majority of sales come from SBs and these shares are fairly similar across the treatment and control stores. The table also shows that milk prices increased after the acquisition and more so for SBs than for NBs. SB milk prices increased more in treatment stores, while NB milk prices increased more in the control stores.

Similarly, table 3 reveals important aspects of the RTE cereal category. There are 119 products in the sample with approximately 14 million units being sold bringing in sales of $41.5 million. The RTE cereal category is dominated by NBs. Approximately 85% of the units sold are NBs, corresponding nearly 90% of total sales. These shares are similar across both treatment and control stores. Finally, prices have increased after the acquisition with SBs increasing more than NBs. Similar to milk prices, NB prices increased more in control stores than treatment stores, and SB prices increased more in treatment stores than in control stores.

Results and Discussion

The pure DID estimates are contained in the bottom panels of table 2 and table 3. These estimates show that the acquisition lowered the average price per unit of milk and RTE cereal products by just under and just over one cent, respectively. The second row of the bottom panel provides DID estimates of the logged prices that can be interpreted as percentage changes. These indicate that the prices decreased by 0.5% for milk and 0.3% for RTE cereal. For milk, the acquisition affects NBs and SBs similarly with prices of both products decreasing by 0.5%. In contrast, for RTE cereal products, the NB and SB prices change in different directions. The NB prices decrease by 0.8% while the SB prices increase by 0.9%.

It should be noted that the pure DID estimates are not controlling for any confounding factors that could be happening at the same time as the acquisition. That is, these pure DID estimates are likely to be biased because they do not account for any market characteristics, time buffers, fixed effects, or other controls. Next, we turn to our regression DID analysis to incorporates these controls.

Table 4 contains the estimated acquisition effects for milk and RTE cereal from the empirical DID regression model specifications. The top and bottom panels contain results for milk and RTE cereal, respectively. Odd and even numbered models provide overall acquisition effects and acquisition effects by brand type, respectively. Moving from left to right more fixed effects are added to the model. Once fixed effects are included, the R^2 drops dramatically because it is now a within-R^2. This measures the amount of price variation explained within each of the fixed effects rather than the overall fit. The final two specifications have all controls and fixed effects added to the model. These last two specifications are the preferred models.

For milk, the overall acquisition effect is somewhere around a 0.3% price decrease. There is no significant difference between NB and SB acquisition effects as seen by the NB-SB difference parameter being insignificant. These price changes are not very large in magnitude economically. In 2013, approximately eight million units of milk were sold in RA's MA stores. From the pre-merger average price of $3.29, this price decrease amounts to around a $78,960 reduction in sales of milk products ignoring changes in unit sales.

For RTE cereal, the overall acquisition effect is around a 0.6% price decrease. In contrast to milk, the acquisition effects are significantly different for NBs and SBs. NB prices decrease by approximately 1%, but SB prices increase by approximately 0.4%, and is insignificant. The difference between these acquisition effects of 1.3% is statistically significant. In 2013, treated stores sold 3.6 million units of RTE cereal with 3.1 million being NB products and 0.5 million being SB products. From the overall pre-merger price of $3.12, the overall acquisition effect price decrease amounts to around a $67,392 reduction in sales for RTE cereal. For NBs, the reduction in sales is even larger; from the pre-merger price of $3.42, this price decrease amounts to a $106,020 reduction in sales. However, this reduction in sales is partially offset by the increase in price for SB products. From the pre-merger price of $2.20, the SB price increase results in around a $4,400 sales increase.

The overall decrease in average prices indicates that the acquiring firm might have achieved significant cost savings due scale economies that outweigh portfolio effects. Alternatively, the price decrease might be due to intensified retailer competition, requiring the acquiring firm to reduce prices. This would happen, if a large competitor with stores that are similar to RA's stores, and dissimilar to RB's stores, responds to the acquisition by lowering prices because the acquiring firm now represents a larger threat to its own market share.

When we investigate the break out of the overall acquisition effects by NB and SB products we obtain our key findings. In RTE cereal category, the main result—that the difference between the change in NB prices and the change in SB prices is negative and significant—indicates that the effects of mergers and acquisitions on product prices can be heterogeneous and that the development of SBs can improve retailers' market power. This result also shows that if aggregate price changes were analyzed, the overall cost savings due to the acquisition would have masked the market power effect.

To provide further insights, we examine whether the market share of SB products in acquired stores has changed after the acquisition. The data reveal that the market share of RA's SB products in the RTE cereal category increased in the acquired stores after the acquisition relative to the share of RB's SB products before the acquisition. As such, the evidence shows that RA has maintained a relatively higher markup on their SBs in the RTE cereal category, while increasing its SBs market share. This could be explained by RA's improved market power after the acquisition on SBs in the RTE cereal category.

For milk, we do not find evidence for differential acquisition effects on NB and SB products. A plausible explanation to this result is that milk is a relatively homogeneous product. A retailer's ability to exercise market power on SBs in the fluid milk category is limited. In contrast, the significant heterogeneous acquisition effects on the RTE cereal product prices are possibly because RTE cereal category is marked with product differentiation and branding.

Robustness Checks

We perform a number of robustness checks to analyze how results of the baseline model change by altering some of the maintained hypotheses. First, we check if removing one-county buffer around the MA from baseline analysis makes any difference on the results. Second, we examine if using weighted prices changes the acquisition effects where the weights are each UPC's share of sales. Weighting will reduce the impact of less popular products. Lastly, we perform three other robustness checks to investigate if the results are sensitive to the buffer around the time of acquisition. These check the effects from excluding data two, four, and six months before and after the acquired stores reopen. The baseline case excludes data for the 8 months before and after the acquired stores reopen.[xiv]

Table 5 contains the results from robustness checks. Under all model specifications we include product-quarter-store fixed effects and estimate acquisition effects by product type. The first column of results contains the final specification from the main results in table 4. Subsequent columns check the one county buffer around the MA, weighting prices by their sales share, and altering the buffer around the acquisition time period, respectively. These results indicate that the final baseline specification is fairly robust to alternative specifications. For milk, the most notable result is that the difference in acquisition effects changes slightly, but remains statistically and economically insignificant. For RTE cereal, the most notable result is that the increase in SB prices becomes significant when changing the buffer around the acquisition. However, the difference between the NB and SB acquisition effects remains robust.

Conclusion

The U.S. food-retailing sector has been marked by two recent trends over the past two decades. First is an increase in concentration. Mergers and acquisitions have been a driver of some of this increase, particularly in the past several years. The second trend is the SB growth and staying power. SBs have continued to grow since the recession of 2008-2009. In this article we investigate the relationship between these two trends because they are intrinsically linked. SBs, controlled by the retailer, may be used as an instrument to exert retailer market power. To explore the connection between retailer concentration and SBs, we analyze the following question: do SB prices change more or less than NB prices after a merger or acquisition?

To answer this question, we perform an ex-post analysis of a food retail acquisition in a large United States city in 2012. Using store scanner dataset at the UPC level, we employ a difference-in-differences estimation strategy to measure the differential impact of the acquisition in two product categories – fluid milk and RTE cereal. The results show that the overall prices decreased around 0.3% for fluid milk and 0.6% for RTE cereal per unit due to the acquisition. Second, we investigate the break out of the overall acquisition effect by NBs and SBs in the two product categories. For milk, the results did not show any statistically significant difference between changes in NB and SB prices due to the acquisition; the acquiring firm reduced prices across the board for all brands. In contrast, for the cereal category the results show that the NB prices decreased by approximately 1% due to the acquisition with no significant changes in the prices of the SBs.

The results show that the acquiring retailer reduced prices across the board for the more homogeneous product category, which would indicate that the acquisition may have created cost efficiencies for the acquiring retailer stores in the MA. However, in the more differentiated product category the results indicate that the acquiring retailer decreased prices only for highly brand competitive, NB RTE cereal products, whereas the acquiring retailer did not change prices or even increased them for SB RTE cereal products. This result indicates that the effects of mergers and acquisitions on product prices can be heterogeneous and that the development of SBs can improve retailers' market power. If aggregate price changes were used, the overall cost savings would have masked this market power effect. That is, the results provide evidence that the growth of SBs contributes to retailer market power, which should be accounted for more directly in merger analyses.

The overall results also indicate that the consumer benefited from the acquisition under study. On the whole, the acquiring retailer consumers in the MA saved just under $200,000 on milk and RTE cereal in 2013 alone. Moreover, these results indicate that consumers might have been affected differentially. For milk drinkers, savings were similar across the brand types in percentage terms. For RTE cereal consumers, however, SB consumers were hurt, while NB consumers were helped. As NB consumers typically have higher incomes, the acquisition under study disproportionately helped those with higher incomes. Thus, the results provide a first glimpse into how mergers and acquisitions may impact different types of consumers in different ways. Future research should be directed to explicitly investigate the heterogeneous effects of mergers and acquisitions on consumer groups.

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Table 1. Empirical tests and their descriptions

Empirical test	Description
$\delta_1 = 0$ $\delta_1 + \delta_2 = 0$	Tests if the acquisition had an effect on any of the prices individually
$\delta = 0$	Tests if the acquisition affected prices at RA stores on average
$\delta_2 = 0$	Tests if store brand price changes are the same as national brand price changes

Table 2. Summary statistics by treatment type – Milk

County Characteristics	Overall			Treatment			Control		
Population	279,739			639,458			135,852		
	(34,760)			(78,174)			(14,089)		
Per Capita Income	41,642			51,257			37,796		
	(993)			(2,192)			(562)		
Food Stores	9.7			25.1			3.6		
	(1.36)			(2.73)			(.50)		
Store Characteristics	Overall			Treatment			Control		
RA Stores	121			66			55		
Product Characteristics	Overall			Treatment			Control		
Product Type	Total	NB[a]	SB[b]	Total	NB	SB	Total	NB	SB
Products	85	68	17	85	68	17	85	68	17
Observations (1,000s)	407.7	269.9	137.8	240.0	164.2	75.8	167.8	105.8	62.0
Units Sold (Mill)	29.7	9.6	20.1	18.0	6.5	11.5	11.8	3.2	8.6
Sales (Mill $)	85.9	30.8	55.1	51.9	20.4	31.6	34.0	10.4	23.5
Units Sold 2013 (Mill)	13.4	4.3	9.1	8.0	2.9	5.2	5.4	1.4	4.0
Share of units sold	100%	32.3%	67.7%	60.3%	35.9%	64.1%	39.7%	26.8%	73.2%
Share of sales	100%	35.9%	64.1%	60.5%	39.3%	60.7%	39.5%	30.7%	69.3%
Price Statistics	Overall			Treatment			Control		
Product Type	Total	NB	SB	Total	NB	SB	Total	NB	SB
Pre-merger Price per unit ($)	3.28	3.64	2.57	3.29	3.62	2.58	3.26	3.67	2.57
	(.003)	(.003)	(.004)	(.004)	(.004)	(.005)	(.004)	(.005)	(.006)
Post-merger Price per unit ($)	3.39	3.72	2.75	3.40	3.69	2.76	3.38	3.75	2.74
	(.003)	(.003)	(.005)	(.004)	(.004)	(.007)	(.004)	(.005)	(.008)
Price Change per unit ($)	.11***	.08***	.18***	.11***	.08***	.18***	.12***	.09***	.17***
	(.004)	(.005)	(.007)	(.005)	(.006)	(.009)	(.006)	(.007)	(.010)
Difference-in-Difference	Total			NB			SB		
DID ($)	-.008			-.010			.011		
	(.008)			(.008)			(.015)		
DID (Log Price)	-.005***			-.005**			-.005		
	(.002)			(.002)			(.004)		

Note: Numbers in parentheses are standard errors. Numbers not in parentheses are averages if there is a corresponding standard error underneath it, while those without standard errors are totals or shares as indicated by the row name. Asterisks indicate statistical significance only in the price change row. ***, **, and * means there was a significant price change at the 1%, 5%, and 10% levels, respectively. The data used for these statistics are observations in the balanced dataset with an 8-month acquisition buffer, buffer counties excluded from the treatment and control, and acquired stores are excluded from the treatment and control.

a. NB stands for national brands.

b. SB stands for store brands.

Table 3. Summary statistics by treatment type – RTE Cereal

County Characteristics	Overall			Treatment			Control		
Population	279,739			639,458			135,852		
	(34,760)			(78,174)			(14,089)		
Per Capita Income	41,642			51,257			37,796		
	(993)			(2,192)			(562)		
Retail Stores	9.7			25.1			3.6		
	(1.36)			(2.73)			(.50)		
Store Characteristics	Overall			Treatment			Control		
RA Stores	119			66			53		
Product Characteristics	Overall			Treatment			Control		
Product Type	Total	NB	SB	Total	NB	SB	Total	NB	SB
Products	154	121	33	154	121	33	154	121	33
Observations (1,000s)	1,005.7	754.2	251.5	563.5	425.2	138.3	442.2	329.0	113.2
Units Sold (Mill)	14.1	11.9	2.2	7.9	6.8	1.2	6.1	5.1	1.0
Sales (Mill $)	41.5	36.8	4.7	23.7	21.1	2.6	17.9	15.7	2.2
Units Sold 2013 (Mill)	6.4	5.4	1.0	3.6	3.1	0.5	2.8	2.3	0.4
Share of units sold	100%	84.5%	15.5%	56.3%	85.4%	14.6%	43.7%	83.5%	16.5%
Share of sales	100%	88.6%	11.4%	57.0%	89.2%	10.8%	43.0%	87.8%	12.2%
Price Statistics	Overall			Treatment			Control		
Product Type	Total	NB	SB	Total	NB	SB	Total	NB	SB
Pre-merger Price per unit ($)	3.08	3.38	2.19	3.12	3.42	2.20	3.03	3.32	2.18
	(.001)	(.001)	(.002)	(.002)	(.001)	(.003)	(.002)	(.001)	(.003)
Post-merger Price per unit ($)	3.11	3.39	2.26	3.14	3.42	2.27	3.07	3.35	2.24
	(.001)	(.001)	(.002)	(.002)	(.001)	(.003)	(.002)	(.001)	(.003)
Price Change per unit ($)	.03***	.01***	.07***	.03***	.00*	.08***	.04***	.03***	.06***
	(.002)	(.001)	(.003)	(.002)	(.002)	(.004)	(.002)	(.002)	(.004)
Difference-in-Difference	Total			NB			SB		
DID ($)	-.012***			-.024***			.017***		
	(.003)			(.003)			(.006)		
DID (Log Price)	-.003***			-.008***			.009***		
	(.001)			(.001)			(.003)		

Note: Numbers in parentheses are standard errors. Numbers not in parentheses are averages if there is a corresponding standard error underneath it, while those without standard errors are totals or shares as indicated by the row name. Asterisks indicate statistical significance only in the price change row. ***, **, and * means there was a significant price change at the 1%, 5%, and 10% levels, respectively. The data used for these statistics are observations in the balanced dataset with an 8-month acquisition buffer, buffer counties excluded from the treatment and control, and acquired stores are excluded from the treatment and control.
a. NB stands for national brands.
b. SB stands for store brands.

Table 4. Results from the DID specification

Model[a]	1	2	3	4	5	6
Acquisition Effects – Milk						
Overall	-.001 (.0035)		-.003 (.0025)		-.003 (.0023)	
NB		.004 (.0034)		-.002 (.0027)		-.002 (.0027)
SB		.004 (.0045)		-.002 (.0039)		-.002 (.0039)
SB-NB difference		-.000 (.0042)		-.000 (.0042)		-.000 (.0042)
Model Statistics						
R^{2b}	.002	.144	.029	.031	.038	.040
Obs	407,743	407,743	407,743	407,743	407,743	407,743
Acquisition Effects – RTE Cereal						
Overall	-.004*** (.0016)		-.006*** (.0013)		-.006*** (.0013)	
NB		-.000 (.0013)		-.010*** (.0013)		-.010*** (.0013)
SB		.017*** (.0027)		.004 (.0025)		.004 (.0025)
SB-NB difference		.017*** (.0028)		.013*** (.0025)		.013*** (.0025)
Model Statistics						
R^{2b}	.0045	0.402	.0017	.0037	.0049	.0068
Obs	1,005,683	1,005,683	1,005,683	1,005,683	1,005,683	1,005,683
Controls & Fixed Effects						
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Unit FE	-	-	Yes	Yes	Yes	Yes
Time FE	-	-	-	-	Yes	Yes

Note: *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively. Standard errors are clustered at the store-product level. All analyses use an eight month buffer around the acquisition.

a. Odd numbered models provide overall effects of the acquisition. Even numbered models provide effects of the acquisition by product type.

b. The R^2 for regressions including fixed-effects are within R^2. They do not account for overall fit of the model. Therefore, these within R^2 can only be compared with other within R^2. They cannot be compared with the R^2 from the regressions without fixed-effects.

Table 5. Acquisition effects under various robustness checks

Model	1	2	4	5	6	7
NB	-..002	-.002	-.002	.000	-.001	-.001
	(.0027)	(.0025)	(.0027)	(.0021)	(.0023)	(.0026)
SB	-.002	-.005	-.002	-.004	-.003	-.002
	(.0039)	(.0037)	(.0039)	(.0033)	(.0038)	(.0041)
SB-NB difference	-.000	-.002	-.000	-.004	-.003	-.000
	(.0042)	(.0040)	(.0044)	(.0038)	(.0043)	(.0046)
R^2	.040	.042	.040	.036	.032	.034
Observations	407,743	450,988	407,743	559,975	483,107	400,640
NB	-.010***	-.009***	-.010***	-.009***	-.010***	-.012***
	(.0013)	(.0012)	(.0013)	(.0010)	(.0011)	(.0012)
SB	.004	.002	.004	.005***	.006***	.004*
	(.0025)	(.0023)	(.0025)	(.0018)	(.0021)	(.0025)
SB-NB difference	.013***	.010***	.013***	.014***	.016***	.017***
	(.0025)	(.0023)	(.0025)	(.0020)	(.0023)	(.0026)
R^2	.0068	.0071	.0068	.0043	.0043	.0069
Observations	1,005,683	1,124,025	1,005,683	1,326,662	1,163,571	975,034
County Buffer	Yes	No	Yes	Yes	Yes	Yes
Dependent Variable[a]	$l(price)$	$l(price)$	$l(wprice)$	$l(price)$	$l(price)$	$l(price)$
Acquisition Buffer[b]	8 Mo.	8 Mo.	8 Mo.	2 Mo.	4 Mo.	6 Mo.

Note: *, **, and *** indicate significance levels of 10%, 5%, and 1%, respectively. Standard errors are clustered at the store-product level.

a. The dependent variable, $l(price)$, is the natural log of a price for a UPC, store, and week. The dependent variable, $l(wprice)$, is the natural log of the weighted price for a UPC, store, and week. The weighted price is the price for a UPC, store, and week multiplied by its average share of weekly sales in that product module for the pre-merger period.

b. Acquisition buffer refers to the number of months removed from analysis before and after the acquired stores were converted to RA store formats. 2 Mo. indicates that the two months before and the two months after this conversion were removed, and so on.

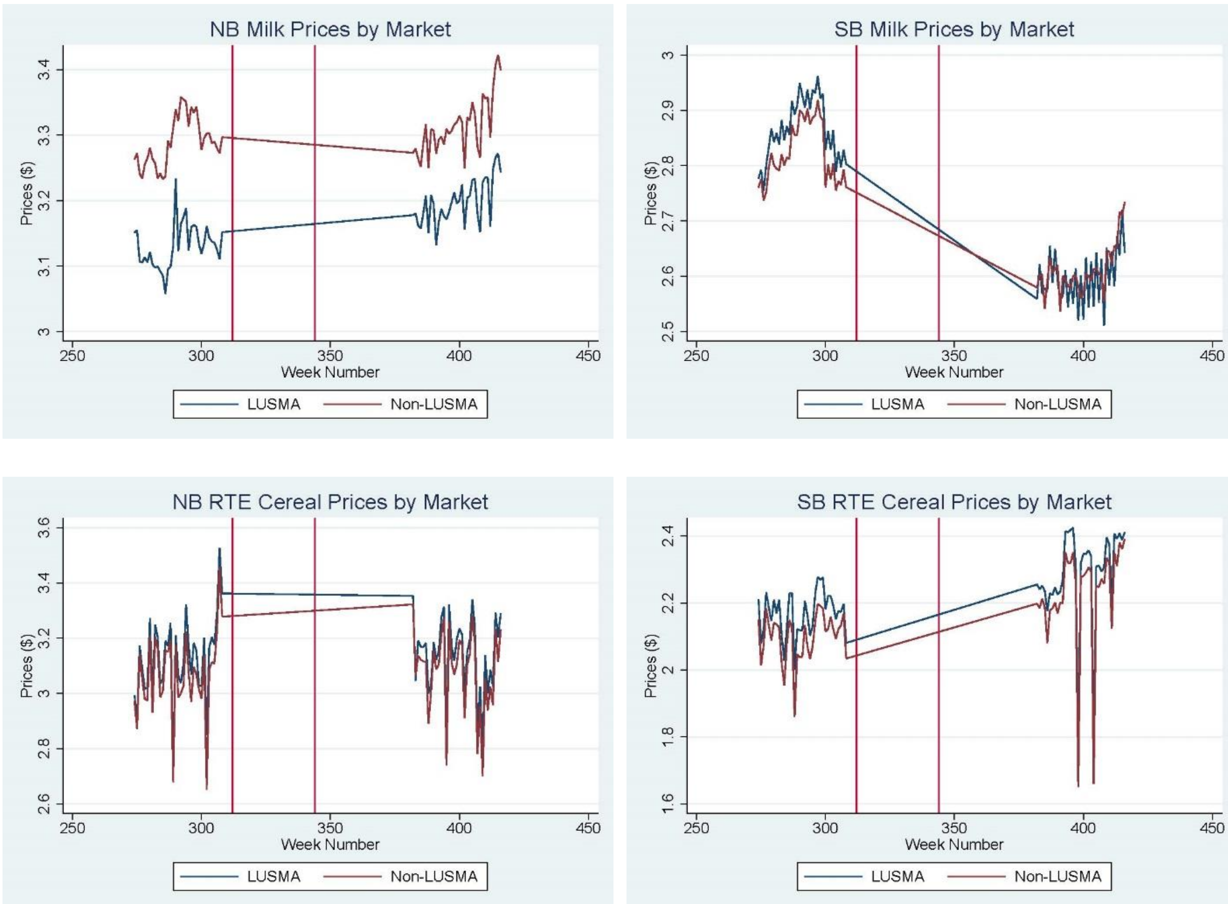

Figure 1. Weighted average milk and ready-to-eat cereal prices (weighted by sales) by market (the MA or non-MA) and brand type (NB and SB)

[i] Store brands are those products that are produced, distributed, and marketed entirely by the retailer. They may be produced directly or through contracts.

[ii] Double marginalization occurs when successive firms in a vertical supply chain exert market power.

[iii] In a homogeneous good market, a pure market share increase allows the merged firm to increase prices.

[iv] Costs may increase due to higher monitoring and coordination problems. However, mergers are often rationalized with expected cost efficiencies. Therefore, this theoretical discussion focuses on potential cost savings.

[v] In order to maintain the confidentiality of the retailer, the name of the market where the acquisition took place is withheld.

[vi] No acquired stores are used in the baseline analysis because of a structural change between retailer management would confound the effects of pure market power changes.

[vii] The effect on store prices for retailers with stores only in (outside of) the MA cannot be identified because a counterfactual cannot be created with stores outside of (in) the MA market.

[viii] Robustness checks include dropping this buffer.

[ix] The analysis can additionally control for potential significant differences across the MA and non-MA stores by estimating pre-acquisition price trends for the control and treatment groups. This allows for time-varying price trends that are not controlled for by product-quarter-store fixed effects and market characteristics. However, this imposes an additional assumption that these are long-run, structural trends which is unlikely to hold. Therefore, the analysis does not include these additional controls in the analysis. Results from alternative model specifications are available upon request.

[x] The dataset is available through the Kilts Marketing Center at the University of Chicago.

[xi] A Google Scholar search of "fluid milk economics" and "Ready-to-Eat cereal economics" returns over 14,000 and over 4,000 results since 2011, respectively. Notable studies related to this essay and focused on these product categories include Cohen and Cotterill (2011) for fluid milk and Nevo (2000) for RTE cereal.

[xii] The following empirical models are run separately for milk and RTE cereal.

[xiii] The bottom panel contains raw difference-in-difference estimates of the acquisition effect. These estimates will be discussed in the results section.

[xiv] See the Data section for more details on the acquisition buffers.