WORKING PAPERS

Do Retail Mergers Affect Competition?
Evidence from Grocery Retailing

Daniel Hosken
Luke M. Olson
Loren K. Smith

I. Introduction

Economists have long believed that, other things equal, increases in market concentration reduce competition. In turn, less competitive markets lead to higher consumer prices and reduce consumer welfare. This belief provides the basis for much of the world's antitrust policy. The U.S., U.K. and E.U., for example, review mergers prospectively. While each agency operates in a different legal environment, the economic logic underlying merger review is the same. Horizontal mergers can create or enhance market power by combining firms producing substitute products.[1] The problem for regulators is determining which mergers are likely to result in reduced competition. Unfortunately, there is remarkably little reliable systematic evidence linking measures of market concentration such as the Herfindahl-Hirschman Index (HHI) to manufacturer markups or consumer prices.[2]

Empirically identifying a causal relationship between price and market concentration is extremely difficult because market concentration is rarely exogenously determined. Demsetz (1973) noted firms that attain large market shares are likely those that are most efficient, and that markets where scale economies are important will tend to be dominated by a small number of efficient firms. As a result, studies that simply estimate the price/concentration relationship without controlling for the endogeneity of market structure are unlikely to be successful (Evans et al. (1993)), Bresnahan and Reiss (1989, 1990)).

In this paper we estimate the relationship between consumer prices and market structure by examining how prices change following significant changes in market structure resulting from horizontal mergers in the supermarket industry. Like other retail industries, the supermarket

[1] See Section 1 of the 2010 U.S. Department of Justice(DOJ)/Federal Trade Commission (FTC) *Horizontal Merger Guidelines* for a clear description of the economic logic underlying U.S. horizontal merger policy.
[2] The Herfindahl-Hirschman Index is defined as the sum of the squared market shares of market participants, where firm's market shares are typically measured as percentage points.

Overall, our results are supportive of the hypothesis that increases in market concentration resulting from mergers cause prices to increase when mergers take place in already concentrated markets. In analyzing horizontal mergers, antitrust agencies look at the level and change in market concentration associated with a merger as a predictor of competitive harm. The 2010 *Horizontal Merger Guidelines*, for example, state that "Mergers in highly concentrated markets [markets with an HHI greater than 2500] that involve an increase in the HHI of more than 200 points will be presumed to be likely to enhance market power."[6] In contrast, mergers in unconcentrated markets (with an HHI of less than 1500) resulting in a small change in market concentration are viewed as unlikely to be anticompetitive. In this study, we estimate the price effects of eight mergers in highly concentrated markets and six mergers in moderately concentrated or unconcentrated markets. Our results tend to confirm the presumptions of antitrust regulators as stated in the Horizontal Merger Guidelines. We find that five mergers resulted in estimated price increases of more than 2% and that four of those were in highly concentrated markets. Five mergers resulted in estimated price decreases of more than 2% and only one of those occurred in a highly concentrated market, while the remaining four mergers were associated with relatively little change in price. These findings are robust to the choice of comparison group and estimation technique.

Our paper contributes to a small but growing literature which estimates the change in price following mergers of competing firms. The goal of most papers in this literature is to measure the efficacy of antitrust enforcement. In the typical study, researchers identify mergers that were likely on the antitrust margin; that is, those mergers that the antitrust authority seriously considered challenging but allowed to go forward. If the merger resulted in a price

[6] The 2010 FTC/DOJ Horizontal Merger Guidelines define highly concentrated markets as those having a Herfindahl-Hirschman Index (HHI) greater than 2500. 2010 Horizontal Merger Guidelines, 5.3.

increase, the researchers concl

The remainder of this paper is organized as follows. Section II describes our data sources, and Section III presents the methodology used to construct our merger and comparison markets. Section IV describes our estimation strategy and presents the empirical findings of the study. Section V concludes.

II. Data

Our study uses three data sources. The first is A.C. Nielsen's Trade Dimensions retail database. Each year Trade Dimensions creates a census of retail outlets operating in the U.S. for a number of retailing industries, including supermarkets, club stores, liquor stores, convenience stores, and restaurants. In this study we focus on the primary formats used for grocery retailing: conventional supermarkets, supercenters, and club stores.[10] Our dataset consists of annual observations, including the location, size, estimated sales, the store's banner (the name the store operates under), and corporate ownership of each supermarket, supercenter, and club store in the U.S. from 2004 through the fall of 2009. An additional feature of the dataset is that every store location has a unique identification number that allows us to track stores over time. For example, we can observe if a location changes ownership or if a supermarket that closes for a time reopens as a supermarket. The dataset also contains information on the ownership of different chains, which is important because many firms operate multiple retail brands, sometimes even within a relatively small geographic area. As we describe in the next section, this data allows us to identify the entry and exit of retailers from local markets and identify the merger of retailers.

[10] We exclude other retail formats in the Trade Dimensions Grocery dataset – limited assortment, natural/gourmet food, warehouse, and military commissary – because they are so differentiated from traditional supermarkets. For

The price data we use consists of the prices used to construct the ACCRA Cost of Living Index, which is published by the Council for Community and Economic Research (CCER). The ACCRA price index is designed to compare the cost of living for moderately affluent professional and managerial households in different U.S. metropolitan areas at a point in time.[11] The price data assembled by CCER are collected by the staffs of the roughly 350 local U.S. Chambers of Commerce who participate in the data collection project. In the first, second, and third quarter of each year, staff of participati

know precisely which Safeway store was sampled. As a result, in our empirical analysis we must treat the broad geographic region as the geographic unit of observation.

We also use price quotes for some non-grocery items in the CCER data to control for unobserved market-specific retailing cost shocks, such as the local price of labor, that could affect grocery prices.[15] We have identified four items that are unlikely to be sold at a supermarket that would be sold at a retailer facing similar costs as a supermarket: a men's dress shirt, boy's jeans, women's slacks, and a three-pack of tennis balls. In contrast to the grocery data, we observe only a single price of these items (rather than multiple price quotes from different retailers).

The CCER data is particularly well suited to our study. First, it contains prices on a broad set of supermarket products designed to measure the typical "market basket" of consumers' food purchases. Second, the data covers more geographic regions within the U.S. than any other publicly accessible pricing data set we are aware of. This allows us to study many mergers and gives us a great deal of flexibility in identifying potential comparison cities to use in both our difference-in-difference analysis and in constructing a synthetic control. Third, we were able to collect a relatively long panel of data (5 years).

There are two key relative weaknesses of the CCER data. The first is data quality. Supermarket scanner data (often provided by A.C. Nielsen or IRI) is recorded at the supermarket and transmitted electronically to the data vendor minimizing the chance for measurement error. The U.S. Bureau of Labor Statistics (BLS) collects price quotes directly from retail outlets using trained surveyors under a strict protocol that has been developed over time to reduce measurement error. In contrast, CCER's price collection method is more informal. While

[15] These controls were also used by Basker and Noel (2009).

surveyors are given a detailed set of instructions to follow in collecting prices,[16] CCER does not enforce a formal sampling scheme. Second, the products contained in the CCER sample are, by construction, composed of frequently purchased supermarket products. As will be discussed in Section IV in more detail, the prices of frequently purchased products are more likely to be strongly affected by changes in competition than a randomly selected grocery product. As a result, the price effects of mergers we estimate likely overstate (in absolute value) the001-2.3 ucti(ice ef) Tw[(e5

are important substitutes to each other because the different retail formats sell some of the same products. Supermarkets, club stores, supercenters, convenience stores, mass-merchandisers (non-supercenter outlets operated by firms Target, Kmart, or Walmart), and drug stores, for example, all carry some food items. However, it is unlikely that all of these retail formats are similarly substitutable to one another. Convenience stores offer a very limited selection of food products in small stores at relatively high prices, while supermarkets and supercenters offer a broad selection of food products (including meat and produce) at relatively low prices in large stores. We limit our attention to the set of retail formats that are likely to significantly affect the pricing of supermarkets large grocery retailers that sell food and other household goods, e.g., cleaning products, where consumers can purchase all of their food for a week at a single retail location (often referred to as offering one-stop-shopping).[18] This limitation results in a set of retailers employing three retail formats: traditional supermarkets,[19] club stores,[20] and supercenters.[21] Even this limited set of formats, however, may be too broad. Club stores, while offering one-stop shopping, offer much more limited product selection than supermarkets or

[18] Recent empirical work shows that supermarkets change their prices in response to competition from supercenters and possibly club retailers suggesting that these retail formats compete with one another, see, e.g., Hausman and Liebtag (2007), Basker and Noel (2009), and Courtemanche and Carden (2011). We are unaware of empirical work

supercenters, and are typically not considered im

and Liebtag (2007), Basker and Noel (2009), Huang and Stiegert (2010)), we do not have sufficient data at the store level to estimate localized price effects. As a result, all of our empirical analysis has to be interpreted as measuring prices within the broad geographic market in which retailers compete.

Market Classification

To implement our difference-in-difference and synthetic control estimators we must identify those regions that experienced a significant change in market structure as the result of a horizontal merger (treatment markets) and those markets that experienced no significant change in market structure as the result of entry, exit, or horizontal mergers (comparison markets). We define a market as experiencing a significant change in market structure if it experiences a horizontal merger, entry, or exit affecting at least five percent of the retail outlets in the market. In our data, some markets experience a single change in market structure while others experience multiple changes in market structure (e.g., entry by a retailer and a merger). To facilitate interpretation, we only estimate the price effect of mergers for those markets whose only significant change in market structure resulted from a single merger during our sample period.

We next define two sets of potential comparison markets that we use as potential controls in the difference-in-difference and synthetic control analysis. The first consists of markets that experienced *no* change in market structure; that is, during the sample period the market experienced no entry, exit, or merger of competing firms. Because all large markets in our data experience some change in market structure (most often the entry or exit of a small chain retailer), there are no large markets in this comparison group (Hanner et al. (2011). For this reason we consider a second set of comparison markets that consists of markets that experienced a *di minimis* amount of exit, entry, or mergers: no single entry, exit, or merger event affected

more than 2% of stores in a market. Below we provide the technical details describing exactly how entry, exit, and mergers are defined in the study.

We define entry as a firm beginning operations as a grocery retailer in a market with a new retail brand; that is, a new firm operating in a market with a new retail brand. Our definition of entry does not include the sale of a local brand to a new firm that continues to operate retail outlets in that market under the same trade name (a new firm operating an old brand).[24] We also do not consider within market expansion – an existing retailer opening new stores of an existing banner in a market – to be entry.[25]

We define exit as an event that causes consumers to lose access to a brand *and* firm in a market. Parallel to entry, we do not view the sale of a retail brand to another corporate parent as brand exit if the subsequent owner continues to operate at least one store in an affected market under the original retail banner. Similarly, if a firm closes some but not all of the stores operating under a given banner, we consider this to be within market contraction and not exit.

In our data we observe two types of transactions that we refer to as horizontal mergers. The most common type of merger we observe occurs when one firm decides to exit a market by selling its existing operations to a current market participant. For example, in exiting the San Francisco, San Jose, and Fresno, California markets in 2007, Albertsons sold its stores to incumbent grocery retailer Save Mart Supermarkets. Save Mart then operated those store locations using a new name, Lucky. The second type of transaction is a traditional merger where an incumbent buys all of the assets of a rival. In this scenario, the acquiring firm may or may not

[24] Although acquisitions of this type clearly represent a change in corporate control and the entry of a new firm (rather than a brand) into a region, the set of products available to consumers (brand names of retailers) do not change as the result of the transaction.

[25] The geographic markets used in antitrust analysis are frequently more narrow than the geographic regions we have defined to be markets. As a result, what we define as a market expansion (e.g., a brand with operations in Los Angeles, California opened a store in Ventura, California) might be interpreted as market entry in an antitrust

operating in the market prior to treatment, a short narrative describing each transaction, and an rough estimate of market concentration in the broad geographic area affected by the merger.[28] There is significant heterogeneity in the size and estimated market concentration of the markets experiencing mergers. Our sample consists of a number of medium-sized U.S. markets, with less than 100 retail outlets, and some massive markets, including metropolitan New York, Philadelphia, and Detroit with hundreds of retail outlets. Over half of our merger sample consists of highly concentrated grocery markets (with estimated HHIs greater than 2,500), while the remaining markets are relatively unconcentrated. New York and Philadelphia, for example, both have HHI's below 1,000. This variability in market concentration provides us with an opportunity to determine if there is a systematic relationship between market concentration and the price effects resulting from consummated mergers.

IV. Empirical Model and Results

The goal of our study is to determine how consumer prices are affected by changes in market structure resulting from horizontal mergers within a retail market. The major issue faced by any study attempting to measure the effect of a change in market structure on retail prices is to develop a reasonable estimate of the counterfactual change in prices had the change not occurred. Simply comparing the average prices in a market affected by a horizontal merger to prices beforehand assumes this counterfactual change is zero, and this simple time difference will be biased if something unrelated but concurrent in timing to the change in market structure

also affected prices. Grocery prices, particularly meat and produce, are highly volatile. An increase (decrease) in the price of some food items coincident

post-merger period for the market affected by treatment, and (in some specifications) controls for time-varying market specific factors (x_{ijt}) which may affect grocery pricing.

$$\log(p_{ijt}) = \gamma_{ij} + \delta_t + \theta(\text{Post-Event}_{ijt}) + \beta x_{ijt} + e_{ijt} \qquad (1)$$

Equation (1) is estimated separately for each merger event relative to the same comparison group, and standard errors are clustered by CBSA.

We next must specify the timing of the event; that is, determine when we think the merger could begin having an effect on grocery pricing. To some extent, we are constrained by our data. While we can identify the year in which a merger took place in the Trade Dimensions data, we have been unable to identify precisely the quarter in which all of the mergers occurred.[30] To avoid contamination bias, we have dropped data corresponding to the year in which the event took place, so that the pre-event and post-event periods are clearly defined. For example, if we observe a merger took place in 2007, we drop data from 2007 from the regression analysis and define 2005 and 2006 as the pre-merger period and 2008 and 2009 as the post-merger period.

We now turn to the issue

average market in the narrow comparison group is much smaller than the average merger market. The major cause of this difference is that all of the large U.S. markets experience some entry, exit, and or mergers by chain grocery retailers; that is, there are no major metropolitan areas in the narrow comparison group. When we weaken the requirement to include those markets that experience small levels of entry, exit, or horizontal mergers, the average market in the broader comparison group becomes much larger. However, because the merger sample consists of some of the largest U.S. metropolitan areas, the average market in the merger group is still much larger than the average market in the broader comparison group.

To address the concern that some markets in the comparison group may not be well matched to the treatment group, we estimate two additional specifications that limit the comparison group to regions experiencing similar pre-merger trending in prices to the merger city. To implement this we estimate a pre-merger price trend for each market in our data using equation (3), where for each market (j) we regress retailer i's (log) price on a retailer/market fixed-effect (γ_{ij}) and a time trend using only data from the pre-merger period.[31]

$$\log(p_{ijt}) = \gamma_{ij} + \quad _j t + e_{ijt} \qquad (3)$$

Unfortunately, our ability to estimate the time trend in grocery prices is limited by our relatively short panel. For markets experiencing mergers in 2007 and 2008, we have only five and eight quarters of data, respectively, to estimate a region's pre-event trend in prices. As a result, our estimate of a region's time trend can be imprecise. Then for each treatment market we compare that treatment market's estimated time trend to that of each market in the comparison group, and

[31] Equation (3) is estimated once for each treatment market (with data restricted to that market's pre-event period). The equation is estimated twice for each comparison city using data from 2005 and 2006, and 2005, 2006, and 2007. When comparing a treatment region to a comparison region, we use the estimate the corresponds to the same estimation period. For example, in constructing a comparison group for New York (which experienced a merger in 2007) we use estimates of α_j for the comparison markets estimated with data from 2005 and 2006.

in most cases, only include those markets whose estimated time trend is within 0.005 of the treatment markets.[32] For example, prior to the merger of A&P and Pathmark in 2007, grocery prices in the New York CBSA were increasing at 1.025% a quarter ($\alpha_{NewYork} \quad 0.01025$). We then limit New York's comparison group to those comparison markets where the trend in grocery prices is within the range of 0.5% and 1.525% per quarter.

We next formally test to determine if a given comparison market's time trend in the pre-merger period is statistically different for each merger/comparison market combination. Specifically, we estimate equation (4) using data on pre-merger prices for all retailers in one treatment market and one comparison group market, and we test whether the interaction of the time trend with an indicator for a retailer being in the merger market is different than zero; i.e., whether prices are trending significantly different from one another in the merger and

disproportionately composed of items that are especially sensitive to competition. Retailers

purchased items, such as Corn Flakes, 2 liter bottles of Coca Cola, and meat items (ground beef, steak, and chicken), which are more likely to be offered on sale than the average supermarket product and are whose prices are more likely to be highly responsive to changes in competition.[34] As a result, it is likely that our price index will be more sensitive to changes in retail competition than an index that included all products sold by the grocery retailer (weighted appropriately by relative expenditures). Despite this shortcoming, our price index should correctly estimate the sign of the price effect of a given treatment on a retailer's pricing, and the *relative* size of the our estimated price effects should correspond to the relative change in a retailer's pricing; that is, where we estimate a large price effect, it is likely that a retailer's prices increased more.

Difference-in-Difference Results

Table 4 presents the empirical results for the difference-in-difference models estimated for those markets experiencing horizontal mergers. Each entry in Table 4 corresponds to the estimated price effect (θ from equation 1) when estimating equation (1) using data from one merger market and some or all of the regions in the broad control group.[35] The first column in each table corresponds to regressions estimated using only retailer/market fixed-effects and time indicators as controls. The second column includes variables that measure within-market expansion or contraction by incumbent supermarket and supercenter retailers as controls for other within-market changes in retail competition which may be contemporaneous with the event being studied.[36] The third column limits the comparison group to those markets with similar pre-

[34] See appendix A for a complete list of items contained in the price index.
[35] We have also estimated the difference-in-difference models using the more restrictive comparison group and have obtained very similar estimated price effects.
[36] The ratio of the number of stores opened (closed) by expanding (contracting) incumbent supermarket

event trends in pricing to the treatment group. The fourth column limits the comparison group to markets whose trends are not statistically different (at the 10% level) from the merger city.[37]

The difference-in-difference results for mergers are consistent with the price concentration hypothesis. While not all mergers in highly concentrated (unconcentrated) markets resulted in price increases (decreases), on average, those mergers generating the largest price increases take place in the most concentrated markets. We find that five mergers are estimated to have increased consumer prices by at least 2%, and that four of these mergers took place in highly concentrated markets (with estimated HHIs of more than 2500). Prices decreased by more than 2% following five mergers, and with one exception, these mergers took place in much less concentrated markets than those experiencing price increases. The remaining four mergers resulted in little change in consumer prices.

Some of our estimated price effects are very large in absolute value. As we noted previously, many of the items in our price index are likely to be more strongly affected by changes in the level of retail competition than a random item. As a result, the CCER bundle may overestimate the overall price effect of the merger. For example, while we estimate that the price

much overall grocery prices changed following these mergers.[38] For this reason, we interpret our estimated price effects as being a relative measure of how much the overall price level changed as the result of a change in market structure. That is, we conclude that the Save-Mart/Albertson transaction in San Francisco and San Jose led to the relatively large price reductions, while the merger of A&P and Pathmark led to more modest price reductions in New York and Philadelphia.

Synthetic Control Groups

The difference-in-differences results presented in the previous section are robust to several regression specifications and comparison groups. This section further assesses the robustness of the empirical results to the choice of comparison group using the synthetic control group estimator developed by Abadie et al. (2010). The synthetic control method uses observed characteristics of geographic markets to construct a synthetic control price (defined to be a weighted average of a subset of the comparison group's prices) for each treatment (merger) market. For example, the best comparison price for Oklahoma City, Oklahoma is the sum of 0.20 times the price index of Providence, RI; 0.19 times the price index of Tampa, FL; 0.16 times the price index of Paducah, KY; 0.12 times the price index of Cedar City, UT; 0.10 times the price index of Tuscaloosa, AL; and smaller proportions of 10 additional CBSA or CSAs. For a given merger market, the optimal weights corresponding to each potential control market's price are determined using data on demographics and prices from the pre-merger period for each potential comparison market. We estimate the price effect of the merger by taking the difference between the observed post-merger price of the merger city and the price of the "synthetic control." Our synthetic control estimator is discussed below in more detail.

[38] To our knowledge, only one study, Ashenfelter et al. (2006), discussed above, has access to such data.

Implementation

Let $t = 1, \ldots, T$ be the time periods covered by the data and let t_0 be the period in which the merger of interest occurred. Define $i = 1$ to be the geographic market in which the merger occurred, and let $i = 2, \ldots, N$ be the $N - 1$ potential comparison markets. p_{it} is the observed average price in market *i* at time *t*, and define p_{it}^{*} to be the average price that would obtain if no merger had occurred. The relationship between p_{it} and p_{it}^{*} in markets $1, \ldots, i, \ldots, N$ is given by

$$p_{it}$$

$$\sum_{j=2}^{J+1} w_j Y_{jt}^N = \sum_{j=2}^{J+1} w_j X_j \beta + \sum_{j=2}^{J+1} w_j \varepsilon_{jt}, \qquad (5)$$

where each $k \times 1$ X_j vector includes market-specific attributes – population, population density, median per capita income, percentage of population that is black, percentage of population that is Hispanic, percentage of population below the poverty level, and price-levels – averaged across time periods 1 to $T_0 - 1$, as well as the change in each of these variables from period 1 to period $T_0 - 1$. The ε_{it} are idiosyncratic unobserved shocks to demand and or costs in market *I* at time *t*. The unknown parameters and weights in equation (5) are estimated by iteratively choosing the $W = (w_2, \ldots, w_{J+1})'$ and V that minimize

$$\left(X_1 - \sum_{j=2}^{J+1} w_j X_j\right)' V \left(X_1 - \sum_{j=2}^{J+1} w_j X_j\right), \qquad (6)$$

where V is a $k \times k$ symmetric positive semidefinite matrix.[40] The optimal weights, $W^* = (w_2^*, \ldots, w_{J+1}^*)'$, are then used to estimate the desired $\hat{Y}_{1t}^N$ and α_{1t}.

We use Stata code developed by Abadie et al. (2010) to estimate the synthetic control model.[41] Abadie et al.'s program requires that there be a single time series for the treatment group being analyzed. Thus, we need to aggregate the data to the level of a market/quarter from a market/retailer/quarter. However, we cannot simply construct a simple average of the retailers' prices in a market, because not all retailers are observed in a market in every time period; that is, the composition of retailers observed in a market varies over time. Therefore, we construct a

[40] We begin each synthetic regression at three different initial *V* matrices. For each initial *V*, we employ a fully nested optimization routine that searches over all diagonal positive definite matrices *V* and weights *w* for the control that minimizes (6). Finally, we choose the control that produced the smallest value of (6) among the three starting *V* matrices.

[41] The Stata programs implementing the synthetic treatment estimator are available at: http://www.mit.edu/~jhainm/synthpage.html.

price index that controls for retailer/market effects. Specifically, we regress retailer i's (log) price in market j at time t on a retailer/market fixed-effect ($_{ij}$) and a series of time indicators. We estimate these regressions at the retailer/market level.

$$\log(p_{ijt}) = \alpha_{ij} \quad _{t} \quad _{jt} \quad _{ijt}$$

understand the importance of this uncertainty, the authors suggest that researchers conduct placebo studies to compare how the measured effect of treatment for the region that actually received treatment compares to the measured effect of treatment for those regions that (by assumption) did not receive treatment. We implement this methodology as follows. For every merger/comparison group combination, we treat each comparison region as if it was "treated" and calculate the average effect of treatment. This generates a distribution of up to 116 placebo

We then sort the estimated price effects (θ_j) from smallest to largest for the comparison group and record which percentile a given merger mark

change in grocery prices post-merger in the market directly affected by the merger relative to the *mean* change in price in the comparison group. As Abadie et al. note, in most aggregate studies these estimates tend to be very precise, and our study is no exception. Virtually all of the standard errors in Table 4 are less than 0.5%. From this we can conclude that the mean change in price in a merger market is different than the mean change in price in the comparison group even for small changes in price (less than 2%). However, the results from the placebo study show that many markets in the comparison groups also experience changes in price similar to those of the treatment markets. For example, roughly 19% of the comparison markets experience reductions in price at least as large as those experienced by Detroit (column 2 Table 4). The results of the placebo studies for both the difference-in-difference and synthetic control estimates show that relatively small estimated price effects (under 2% in absolute value) are not uncommon in the comparison group. As a result, we cannot be confident that relatively small estimated price effects were caused by the merger rather than other factors.

V. Conclusion

Antitrust enforcement agencies must decide how many competitors are necessary to maintain competition within a market. The answer to this question depends on market specific supply and demand factors such as the degree of product differentiation, ease of entry and expansion, and the model of competition that best fits the industry. By examining a relatively large number of mergers taking place in the same industry that occurred at roughly the same time we can draw some conclusions about how changes in market structure caused by a merger affect prices. Despite the relative ease of entry and expansion and low aggregate profit margins, we find evidence that horizontal mergers in the supermarket industry can result in significant

References

Abadie, Alberto, Diamond, Alexis, and Jens Hainmueller. 2010. "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," *Journal of the American Statistical Association* 105, 493-505.

Ashenfelter, Orley, Ashmore, David, Baker, Jonathan, Gleason, Suzanne, and Daniel Hosken. 2006. "Empirical Methods in Merger

Hausman, Jerry and Ephraim Liebtag. 2007. “Consumer Benefits from Increased Competition in Shopping Outlets: Measuring the Effect of Wal-Mart,” *Journal of Applied Econometrics* 22 (7), 1157-77

Hosken, Daniel, and David Reiffen. 2004a. "Patterns of Retail Price Variation." *RAND Journal of Economics* 35 (1), 128-146

----, and----. 2004b. "How Retailers Determine Which Products Should Go on Sale: Evidence from Store-Level Data." *Journal of Consumer Policy* 27 (2), 141-177

Huang, Kun and Kyle Stiegert. 2009. “Evaluating a Supermarket Merger Event: The Case of Copps and Kohl’s in Madison WI,” *FSRG Monograph Series, #21*

Hunter, Graeme, Leonard, Gregory, and Steven Olley. 2008. “Merger Retrospective Studies: A Review,” *Antitrust* 23 34-41

Kim, E. and Vijay Singal. 1993. “Mergers and Market Power: Evidence from the Airline Industry.” *American Economic Review* 83, 549-569.

Lal, Rajiv, and Carmen Matutes. 1994. "Retail Pricing and Advertising Strategies." *Journal Of Business* 67 (3), 345-370.

MacDonald, James M. 2000. "Demand, Information, and Competition: Why Do Food Prices Fall at Seasonal Demand Peaks?" *Journal of Industrial Economics* 48 (1), 27-45.

Matsa, David A. 2011. "Competition and Product Quality in the Supermarket Industry." *Quarterly Journal of Economics* 126 (3),1539-1591.

Nevo, Aviv and Michael Whinston. 2010. “Taking the Dogma out of Econometrics: Structural Modeling and Credible Inference,” *Journal of Economic Perspectives* 24 (2), 69-81

Pautler, Paul. 2003. “Evidence on Mergers and Acquisitions.” *Antitrust Bulletin* 48, 119-207.

Prager, Robin and Timothy Hannan. 1998. “Do Substantial Horizontal Mergers Generate Significant Price Effects? Evidence from the Banking Industry.” *Journal of Industrial Economics* 46, 433-452

Silvia, Louis and Christopher Taylor. 2009. “Petroleum Mergers and Competition in the Northeast United States,” *forthcoming International Journal of the Economics of Business*.

U.S. Department of Justice (DOJ) and FTC. 2010. *Horizontal Merger Guidelines*. Washington, DC: DOJ and FTC

Weinberg, Matthew. 2008. “The Price Effects of Horizontal Mergers,” *Journal of Competition Law and Economics*, 4 (2), 433-447

Market	Merger Year	Merger Description	Stores	Revenue Share	Stores	Revenue Share	Chains	Independents	Stores	Merger Revenue HHI	Change in HHI
Albuquerque, NM	2007	Albertsons buys 8 Raleys stores, 6 continue to operate; more stores in purchase, Raleys continued operation in N. Nevada and N. California.	10	0.09	8	0.06	7	14	72	3251	110
Detroit-Warren-Livonia, MI	2007	Kroger acquires roughly 20 Farmer Jack Supermarket locations from Great A & P Tea Co.	73	0.15	Grry73h.reat A & P Te		2088.				

Table 1: Description of Mergers Studied

Market	Merger Year	Merger Description	Aquiring Firm		Aquired Firm		Pre-Merger Firms In Market		Market		
			Stores	Revenue Share	Stores	Revenue Share	Chains	Independents	Stores	Merger Revenue HHI	Change in HHI
San Francisco-Oakland-Fremont, CA	2007	Save Mart Super Markets buys 42 stores from Albertsons.	13	0.05	42	0.11	23	73	317	2152	98
San Jose-Sunnyvale-Santa Clara, CA	2007	Save Mart Super Markets buys 8 stores from Albertsons.	8	0.06	19	0.11	21	27	145	1729	134
Topeka, KS	2008	Kroger buys 3 stores from Assoc Wholesale Grocers Inc.	7	0.27	6	0.11	4	11	30	3572	597

Table 2: Market Characteristics by Market Type Prior to Treatment

	Market Type		
	26.43	25.67	30.32

Merger Market	p-value<.05	p-value<.1	p-value<.15	p-value<.2
Albuquerque	0.74	0.88	0.91	0.93
Detroit	0.02	0.05	0.08	0.11
Evansville	0.03	0.05	0.09	0.09
FortSmith	0.26	0.35	0.41	0.49
FortWayne	0.32	0.46	0.54	0.59
Fresno	0.19	0.28	0.35	0.41
Muskogee	0.02	0.03	0.07	0.08
NewOrleans	0.11	0.14	0.22	0.29
NewYork	0.10	0.18	0.27	0.36
OklahomaCity	0.26	0.35	0.39	0.46
Philadelphia	0.19	0.26	0.33	0.37
SanFrancisco	0.20	0.32	0.34	0.37

Region	1	2	3	4
Albuquerque	-0.0316	-0.0327	-0.0532	-0.0441
	(0.00357)	(0.00416)	(0.0126)	(0.0101)
Detroit	-0.0272	-0.0273	-0.026	-0.0274
	(0.00361)	(0.00406)	(0.00665)	(0.00380)
Evansville	0.0191	0.0192	0.0188	0.0189
	(0.00348)	(0.00364)	(0.00506)	(0.00341)
Fort Smith	0.0358	0.0359	0.0356	0.0388
	(0.00344)	(0.00362)	(0.00746)	(0.00486)
Fort Wayne	-0.0112	-0.0111	-0.0108	-0.0129
	(0.00367)	(0.00373)	(0.0115)	(0.00448)
Fresno	0.0421	0.0423	0.0404	0.0441
	(0.00352)	(0.00390)	(0.00717)	(0.00450)
Muskogee	-0.000405	-0.000236	-0.000752	-0.000438
	(0.00344)	(0.00360)	(0.00732)	(0.00354)
New Orleans	0.03	0.0305	0.0296	0.0299
	(0.00344)	(0.00457)	(0.00732)	(0.00382)
New York	-0.0182	-0.018	-0.0152	-0.0177
	(0.00350)	(0.00365)	(0.00831)	(0.00402)
Oklahoma City	0.0582	0.0573	0.0648	0.0611
	(0.00345)	(0.00451)	(0.00785)	(0.00486)
Philadelphia	-0.0437	-0.0425	-0.0476	-0.0438
	(0.00345)	(0.00443)	(0.00458)	(0.00393)
San Francisco	-0.133	-0.133	-0.135	-0.134
	(0.00347)	(0.00467)	(0.00411)	(0.00399)
San Jose	-0.105	-0.107	-0.104	-0.105
	(0.00342)	(0.00542)	(0.00635)	(0.00378)
Topeka	0.0869	0.0874	0.0929	0.087
	(0.00342)	(0.00384)	(0.00540)	(0.00346)
Specification				
Market/Retailer Fixed-Effects	x	x	x	x
Quarter Indicators	x	x	x	x
Broad Comparison Group	x	x	x	x
Measures of within market expansion or contraction by incumbent retailers.		x		
Limit comparison to those with similar pre-merger trending			x	

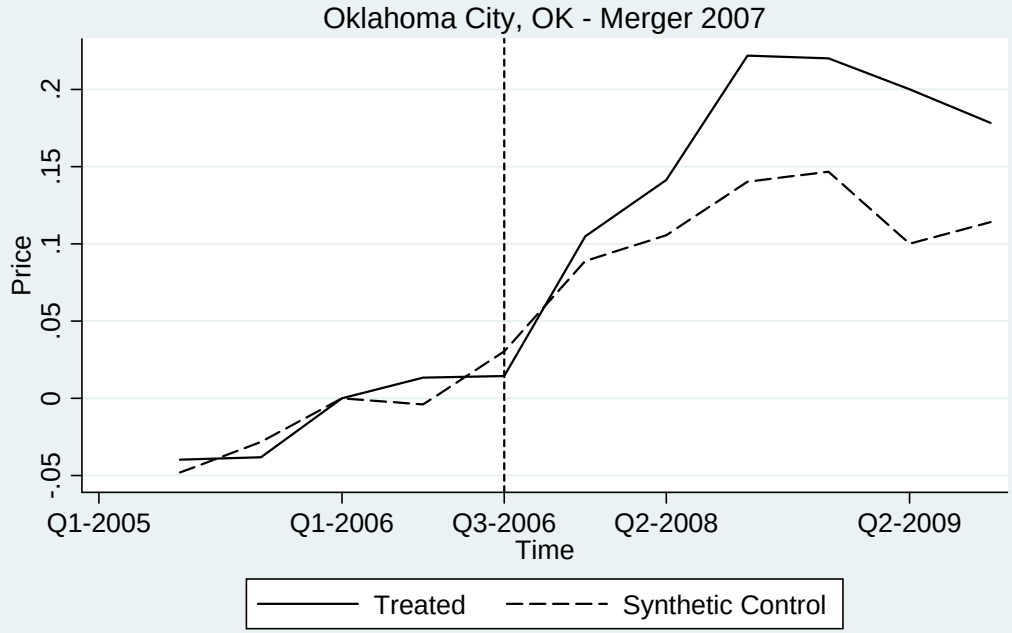
Limit compar11 -01o6.0 7 Tc0 6T94 -0.10rexsmilar pre-mergwhere54 TD0 Tc0 6w(x)Tɟ28.00 6w is

Table 5: Estimated Price Effects Mergers
Comparison of Difference-in-Difference and Synthetic Control Estimates

		Difference-in-Difference		Synthetic Control	
Merger Market	**Pre-Merger HHI**	Coefficient	Percentile Of Counterfactual Distribution	Coefficient	Percentile Of Counterfactual Distribution
Albuquerque	3251	-0.035	0.10	-0.026	0.27
Detroit	1260	-0.020	0.19	-0.053	0.14
Evansville	3331	0.013	0.54	0.006	0.53
Fort Smith	5278	0.048	0.84	0.065	0.94
Fort Wayne	2943	-0.001	0.56	-0.032	0.20
Fresno	1705	0.054	0.89	0.040	0.88
Muskogee	3375	0.010	0.47	-0.007	0.51
New Orleans	3462	0.035	0.75	0.019	0.75
New York	597	-0.009	0.32	-0.017	0.40
Oklahoma City	3961	0.070	0.93	0.062	0.94
Philadelphia	817	-0.035	0.11	-0.040	0.17
San Francisco	2152	-0.117	0.03	-0.115	0.04
San Jose	1729	-0.095	0.03	-0.078	0.09
Topeka	3572	0.077	0.96	0.060	0.92

Note: The difference-in-difference models include time indicators and market fixed-effects.

Figure 1



Note: data from the merger year - 2007 - is excluded from the graph

Appendix Table 1: Items in Grocery Bundle

Product	Expenditure weight	Product Description
T-bone Steak	0.031121	Price per pound
Ground Beef or Hamburger	0.031121	Price per pound, lowest price, min 80% lean
Sausage	0.03751	Price per pound, Jimmy Dean or Owens Brand, 100% pork
Frying Chicken	0.03648	Price per pound, whole fryer
Chunk Light Tuna	0.035243	6.0 oz can, Starkist or Chicken of the Sea
Whole Milk	0.034522	Half-Gallon Carton
Eggs	0.008141	One dozen, Grade A large
margarine	0.004288	One Pound, Cubes, Blue Bonnet or Parkay
Parmesan Cheese, grated	0.065746	8 oz. cannister, Kraft brand
Potatoes	0.030524	10 lb., white or red
Bananas	0.056884	Price per pound
Iceberg Lettuce	0.026154	Head, approximately 1.25 pounds
Bread, White	0.08512	24 oz loaf, lowest price, or prorated 24 oz. equivalent, lowest price
Fresh Orange juice	0.016255	64 oz (1.89 liters) Tropicana or Florida Natural Brand
Coffee, vacuum-packed	0.036501	11.5 oz. can, Maxwell House, Hillse Brothers, or Folgers
Sugar	0.03514	4 pound sack, cane or beet, lowest price
Corn Flakes	0.038438	18 oz., Kelloggs's or Post Toasties
Sweet Peas	0.012675	15-15.25 oz. can, Del Monte or Green Giant
Peaches	0.013836	29 ounce can , Hunts, Del Monte, Libby's, or Lady Alberta
Facial Tissues	0.051628	200-count box, Kleenex Brand
Dishwashing Powder	0.051628	75 oz. Cascade dishwashing powder
Shortening	0.017765	3 pound can, all vegetable, Crisco brand
Frozen Meal	0.099643	8 to 10 oz., frozen chicken entrée, Health Choice or Lean Cuisine brand
Frozen Corn	0.012675	16 oz., whole kernel, lowest price
Potato Chips	0.078015	12 oz. plain regular potato chips
Soft Drink	0.052947	2 liter Coca Cola excluding any deposit

Appendix Table 2: List Of Broad Comparison Group Cities

Americus, GA
Ames, IA
Atlanta-Sandy Springs-Marietta, GA
Austin-Round Rock, TX
Bakersfield, CA
Baltimore-Towson, MD
Beaumont-Port Arthur, TX
Bellingham, WA
Boise City-Nampa, ID
Boston-Cambridge-Quincy, MA-NH
Bradenton-Sarasota-Venice, FL
Bridgeport-Stamford-Norwalk, CT
Brownsville-Harlingen, TX
Burlington, IA-IL
Carlsbad-Artesia, NM
Cedar City, UT
Champaign-Urbana, IL
Charleston, WV
Charleston-North Charleston-Summerville, SC
Charlottesville, VA
Cincinnati-Middletown, OH-KY-IN
Columbia, MO
Columbus, OH
Corpus Christi, TX
Dallas-Fort Worth-Arlington, TX
Danville, IL
Dayton, OH
Decatur, IL
Denver-Aurora-Broomfield, CO
Des Moines-West Des Moines, IA
Dodge City, KS
Dubuque, IA
Durham-Chapel Hill, NC
Dyersburg, TN
Erie, PA
Fairbanks, AK
Fargo, ND-MN
Farmington, NM
Findlay, OH
Flagstaff, AZ
Gainesville, FL
Garden City, KS
Grand Junction, CO
Greenville-Mauldin-Easley, SC
Hartford-West Hartford-East Hartford, CT
Hays, KS
Hickory-Lenoir-Morganton, NC
Hot Springs, AR
Houston-Sugar Land-Baytown, TX
Idaho Falls, ID
Indiana, PA
Indianapolis-Carmel, IN
Ithaca, NY
Jefferson City, MO
Kansas City, MO-KS
Kennewick-Pasco-Richland, WA
Kodiak, AK
Lafayette, IN
Lake Charles, LA
Lake Havasu City-Kingman, AZ
Lancaster, PA
Laramie, WY
Las Cruces, NM
Las Vegas-Paradise, NV
Lima, OH
Little Rock-North Little Rock-Conway, AR
Los Angeles-Long Beach-Santa Ana, CA
Louisville/Jefferson County, KY-IN
Mason City, IA
McAllen-Edinburg-Mission, TX
Memphis, TN-MS-AR
Miami-Fort Lauderdale-Pompano Beach, FL
Mobile, AL
Morristown, TN
Nashville-Davidson--Murfreesboro--Franklin, TN
New Haven-Milford, CT
Gunnison CO
Norwich-New London, CT
Odessa, TX
Omaha-Council Bluffs, NE-IA
Orlando-Kissimmee, FL
Paducah, KY-IL
Palestine, TX
Phoenix-Mesa-Scottsdale, AZ
Pittsburgh, PA
Portland-Vancouver-Beaverton, OR-WA
Prescott, AZ
Providence-New Bedford-Fall River, RI-MA
Pueblo, CO
Punta Gorda, FL
Quincy, IL-MO
Raleigh-Cary, NC
Richmond, VA
Riverside-San Bernardino-Ontario, CA
Salt Lake City, UT
San Angelo, TX
San Antonio, TX
Seattle-Tacoma-Bellevue, WA
Sheboygan, WI
Shreveport-Bossier City, LA
Springfield, MO
St. Cloud, MN
St. George, UT
St. Louis, MO-IL
Tampa-St. Petersburg-Clearwater, FL
Tucson, AZ
Tuscaloosa, AL
Twin Falls, ID
Tyler, TX
Valdosta, GA
Virginia Beach-Norfolk-Newport News, VA-NC
Washington-Arlington-Alexandria, DC-VA-MD-WV
Waterloo-Cedar Falls, IA
Wausau, WI
Wilmington, NC
Worcester, MA
Yuma, AZ