The Interplay of Firm Positioning and Firm Resources

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DISSERTATION ACCEPTANCE CERTIFICATE

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Abstract

How do firm positioning and resources dynamically interact in the context of competition? The literature on competitive strategy has extensively studied positioning-based and resource-based strategies but the interplay between the two remains underexamined. This dissertation aims to advance our understanding of this interplay by examining how firm positioning affects the value of firm resources (such as brand value) and vice versa and how those dynamics, in turn, affect performance. This, I hope, will contribute to a more dynamic and integrated understanding of competitive strategy.

Methodologically, this dissertation uses econometric analyses at the product, portfolio, and firm levels. While much of the competitive strategy literature has focused on the industry or firm levels, this dissertation uses large-sample data at granular units of analysis to examine in depth the interactions and interdependencies between a given firm's positioning, underlying resources, and performance. This dissertation focuses on the performance implications of (a) co-opetition between manufacturers and retailers, (b) induced repositioning as a result of regulatory constraints, and (c) CEO activism on controversial issues.

My findings contribute to the competitive strategy literature by (a) unpacking the dynamics, tradeoffs, and boundary conditions of vertical co-opetition, (b) shedding light on how induced repositioning constrains firms and affects the value of resources, and (c) evaluating whether non-market actions (such as CEO activism) can serve as an intangible resource to

enhance a firm's positioning. The practical implications of this research include helping organizations evaluate when it is optimal to cooperate with competitors and how to respond to environmental shocks (such as regulation).

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Chapter 1

Vertical Co-opetition and the Hidden Channel

1.1 Introduction

The interplay of competition and cooperation is at the heart of strategic management (Brandenburger & Nalebuff, 1997). However, the interplay between competition and cooperation have been understudied, especially with respect to the effects of this interplay on rivals. In this paper, I explore cooperation and competition in a vertical setting and show that alignment in incentives, such as through joint product development between suppliers and retailers, can create a *hidden channel* that links the partners. This coordination decreases direct inter-partner competition but increases business stealing from rivals.

Given that the literatures on competition and cooperation have evolved nearly independently, it is unsurprising that many questions regarding their interactions remain unexplored. Strategy research on competition is rooted in the industrial organization economics literature (Porter, 1979), in which firm positioning and industry structure are the key drivers of profitability. Subsequently, the literature on the resource-based view focused on the role of a firm's idiosyncratic resource endowment and of competition in the factor market (Wernerfelt, 1984; Barney, 1991). Hence, the literature on competition has followed the logic that competitive interactions among firms drive performance (Tirole, 1988; Hoffmann *et al.*, 2018). In parallel, strategy research on cooperation has focused on how firms can share a common interest and create value to enhance performance. In this stream, cooperation through strategic alliances, joint ventures, and research consortia contributes to performance directly, not just by reducing rivalry (Hennart, 1988; Kogut, 1988). Most recently, scholars who study competition and cooperation—observing firms simultaneously compete and cooperate—have called for a more detailed examination of the interplay between the two, especially in a vertical setting (Dussauge, Garrette & Mitchell, 2000; Chen, 2008; Hoffmann *et al.*, 2018; Mathias *et al.*, 2018).

This paper examines the dynamics of co-opetition in a vertical setting, evaluating the tradeoffs a firm faces when determining how best, given its product portfolio, to pursue co-opetition. Vertical relationships have largely been examined in the context of value appropriation between partnering firms, with limited consideration of the broader impact on upstream or downstream rivals (Chen, 1996; Dussauge, Garrette & Mitchell, 2000; Hoffmann *et al.*, 2018). But since firms do not exist in a vacuum, co-opetition in a vertical setting is likely to significantly affect rivals. Further, a firm's existing portfolio of products can increase or decrease its incentives to cooperate and compete.

To shed light on this question, I empirically examine the firm responses and performance impacts of vertical co-opetition. Unlike the existing literature that solely focuses on pairwise dynamics (e.g., using competitive measures to predict cooperative outcomes between two firms (Harrigan, 1988; Khanna, Gulati & Nohria, 1998; Dussauge, Garrette & Mitchell, 2000)), this paper examines impacts on the firms engaged in co-opetition as well as impacts on their rivals. To study co-opetition in the vertical setting, I examine the consumer-packaged goods (CPG) industry. Given that national brand manufacturers and retailer-owned private labels compete directly, cooperation between national brand manufacturers and retailers can occur when the firms jointly develop products, leading to implications for the partners and their rivals.

I exploit a natural experiment in the ready-to-eat breakfast cereal industry in which the merger between a leading brand manufacturer, Post Cereal Holdings, and the largest private-label maker, Ralston Corporation, created a "dual-tracker" that makes both national-brand and private-label products. As an example, before the merger, Post Cereals supplied Walmart with Post banded Honey Bunches of Oats and Ralston supplied it with Great Value Crunchy Honey Oats—Great Value being Walmart's umbrella private-label brand, encompassing detergent, milk,

coffee, and much more. After the merger, Post-Ralston supplied both products. Thus, while Post-Ralston and the retailers remain competitors (i.e., Post Honey Bunches of Oats vs. Walmart's Crunchy Honey Oats), they also now cooperate on developing private-label products such as Walmart's Crunchy Honey Oats. From the retailers' perspective, I examine how sourcing both branded and private-label products from the same manufacturer changes a retailer's incentives—including the role of its private-label portfolio—to coordinate with Post-Ralston.

The private-label and cereal setting have two features that make it especially worthy of study. First, the private-label industry is important because of its size and impact. Internationally, private-label sales account for 51.8 percent of 2018 CPG unit sales in Spain, 46.2 percent in the United Kingdom, and 45.5 percent in Germany (PLMA, 2018). In the United States, 2018 private-label sales reached $128.6 billion, making up 22.3 percent by unit of all CPG sales (Nielsen, 2019). AmazonBasics batteries are estimated to account for one in three batteries sold online, outpacing Duracell and Energizer. In 2018, Walmart, Target, Kroger, and Albertsons all introduced new private-label products, with some of those companies launching over 1,400 new items (Terlep & Friedman, 2018). The growth of private labels is not limited to CPG. Of the $351 billion in 2018 US apparel sales,[1] an estimated 45 percent were private-label—up to 65 percent in some subcategories. Kumar and Steenkamp (2007) estimate that worldwide private-label sales total over one trillion dollars.[2]

Second, the cereal industry provides unique empirical advantages that make testing theories on vertical co-opetition feasible. The industry is highly differentiated with numerous products, each occupying a unique product space. Because private-label products are designed to imitate their branded counterparts, I use product descriptions to create matched pairs consisting

[1] (Department, 2020).
[2] Based on 2007 estimates. Estimates for 2020 are likely to be much higher.

of a private-label product and its branded counterpart. Studying the interactions of these pairs allows me to generate findings on the impact of vertical co-opetition on vertical and horizontal competition dynamics. In addition, the cereal industry is dominated by four branded firms and one private-label firm; together, they supply more than 80 percent of branded products and 60 percent of private-label products to all US retailers. Furthermore, manufacturing cereal products (both branded and private-label) requires high fixed investments and proprietary technology, making market entry difficult.[3] The limited number of firms in the industry and the lack of entry and exit reduce the complexity in identifying changes to competition. Finally, the cereal category has high profit margins (Nevo, 2001), making it an ideal category for private-label products.

My first set of findings assesses the impact—after the Post-Ralston merger—of private-label co-opetition between Post-Ralston and retailers on performance. I find that after Post-Ralston began supplying retailers with private-label products, sales of private-label counterparts to Post-Ralston's branded products decreased with respect to sales of private-label counterparts to other branded products (i.e., General Mills, Kellogg's, PepsiCo).

My second set of findings assesses the strategic response from retailers. I find that after the Post-Ralston merger, new product introduction and the level of in-store advertisement for private-label counterparts to Post-Ralston's branded products decreased with respect to that of private-label counterparts to other branded products.

My third set of findings explores boundary conditions under which the hidden channel (i.e., vertical cooperation) has the greatest effect on competition dynamics and performance. All else equal, I find that a retailer with a large private label portfolio of products spanning multiple

[3] Retailers view dedicated private-label manufacturers other than Ralston as too low in quality for the retail market segment I focus on.

categories in the form of an umbrella brand (such as Walmart's Great Value) is less willing to adjust its strategy to favor an individual manufacturer such as Post-Ralston.

These findings contribute to the co-opetition literature in two ways: by providing one of the first studies of vertical co-opetition and by examining how a firm's existing portfolio of products affects its willingness to cooperate with individual manufacturers. Research has hinted and theorized at how vertical cooperation between downstream and upstream firms could breed competition through knowledge spillover to suppliers (Alcacer & Oxley, 2014) and value-chain climbing (Wan & Wu, 2017). I augment this literature by linking vertical cooperation with realized product market competition. My product-level analysis makes it easier to measure differential competitive outcomes by focusing on each partner's incentives.

In the co-opetition literature concerning *value creation* and *value appropriation*, Khanna, Gulati & Nohria (1998) offer theories that distinguish between private and common benefits while Mathias *et al.* (2018) identify critical motivations for firms to pursue a common goal. However, this literature largely ignores the impact on rivals to the cooperating and competing partners. In contrast, I examine how, in mature industries, co-opetition can have spillover effects on rivals, which is vital for understanding the conditions under which co-opetition results in value creation versus value appropriation. In such industries where sales are saturated, changes in one firm's sales must affect others' sales. I therefore argue that at an industry level, co-opetition in mature industries does not create but rather reallocates value—through business stealing.

Similarly, my research contributes to the corporate strategy literature by indicating how retailers' resources can affect cooperation with vertical partners. When retailers have built up substantial private-label resources across multiple categories, changes to one category can spill

over to others. I find that when retailers have significant private-label resources in the form of an umbrella brand (such as Walmart's Great Value and Costco's Kirkland), they are less likely to alter their existing private label strategy and consider motivations of their private label partners.

The remainder of the paper is organized as follows: Section 1.2 describes private-label products. Section 1.3 applies competition theory to strategic interactions between branded and private-label products. Section 1.4 describes the data. Section 1.5 describes the empirical analysis of performance. Section 1.6 concludes.

1.2 The Rise of Private-label Products

Private-label products have long played an important role in many industries. In the apparel industry, private labels are known as "exclusive brands"; the Nordstrom department store chain, for example, has 23 exclusive brands, ranging from Zella, an athletic wear line, to Halogen, an affordable work line.

Traditionally, heavy advertising has helped national brands gain a strong bargaining position against retailers. Consumers expect a grocery store to have well-known brands such as General Mills Cheerios and Kellogg's Frosted Flakes. Brand manufacturers often take advantage of that when negotiating with retailers. However, as retailers strengthen their private-label products, they are finding ways to usurp this manufacturer bargaining power.

Private labels, like counterfeits and generics, imitate branded products. With private labels, however, retailers retain the intellectual property of the product and control key decisions on product positioning, branding, and quality. Whereas the marketing and economics literature has mainly focused on the impact of counterfeits and generics (Yi, 2008; Qian, 2014), I examine how private-label products alter the relationship between manufacturers and retailers. For the

remainder of this paper, the term "private-label products" will refer to store-owned brands that are marketed and controlled by the retailer, thus excluding counterfeits and generics.

1.2.1 Brand Manufacturer's Perspective

Private-label products were once a popular strategy used primarily by brand manufacturers in order to price discriminate (Federal Trade Commission, 1962), dispose of excess production (Cook & Schutte, 1967), expand into price-sensitive segments (Stern, 1966), and appeal to buyers who prefer cheaper and lower-quality goods during an economic downturn (Hoch & Banerji, 1993; Chen, 2009). However, in recent decades, brand firms have gradually ceded control of private labels to retailers (Insights CB, 2018), leading to a dramatic rise in the number of categories with private-label products, especially of categories with low entry barriers for private labels (Chen, 2009).

As private-label products grew rapidly both online and offline, many brand manufacturers entered the private-label space. These firms, also known as "dual-trackers," concurrently make both branded and private-label products and often dominate the private-label space, besting dedicated private-label producers by means of better technology, greater know-how (such as product formulas), and greater overall capabilities. In the US, it is estimated that about half of all national-brand firms also make private label products (Quelch & Harding, 1996; Kumar & Steenkamp, 2007). Although producing private labels may cannibalize the original product, research suggest that there also exists potential gains including a stronger alliance with retailers (ter Braak *et al.*, 2013).

1.2.2 Retailers' Perspective

Retailers both online and offline have rapidly grown their private-label businesses. Online, CPG sales (both branded and private-label) account for 10 percent of all CPG sales. E-

commerce retailers such as Amazon have changed their search algorithms to favor their own private-label products (Mattioli, 2019). Offline, 17 percent of all CPG sales in physical stores are private-label.

Private-label products' growth can be attributed to both supply- and demand-side dynamics. On the supply side, advances in general manufacturing capabilities significantly narrowed the quality gap between branded and private-label products. No longer are private labels just low-quality alternatives to their branded counterparts; in many cases, they are of equal or superior quality (Nielsen, 2019). In addition, increased consolidation of retailers has dramatically shifted bargaining power away from brand manufacturers toward retailers (Gruver, Meacham & Tager, 2011; AIM, 2016), including decisions about production, distribution, marketing, and sales (Pauwels & Srinivasan, 2004; ter Braak *et al.*, 2013).

On the demand side, while consumers of previous generations exhibited strong brand loyalty, millennials are much more interested in product functionality and value (PLMA, 2014; Heyward, 2020). For example, when a millennial shopper's favorite national brand is unavailable in a given store, 40 percent choose the private label, one in three pick a different (rival) national brand, one in eight try other stores, and only five percent delay the purchase (PLMA, 2014). Second, for 71 percent of shoppers in general, value for the money is the main reason they purchase private labels over branded products. More than 60 percent agreed that private labels are as good if not better than branded products (PLMA, 2014). Consumer behavior has also shifted as shoppers become increasingly loyal to their favorite stores. Although consumers shop often, a majority do their regular grocery shopping at only two stores and only 23 percent recently switched to a different store for their regular shopping. One key driver of the increase in store loyalty is that Americans are far less likely to relocate than they used to be; only 12 percent

moved each year today versus more than 20 percent in the 1950s. Finally, the US economic recession has significantly changed shopping habits as consumers collect more coupons and promotions, reduce impulse buying, and buy more private labels (PLMA, 2015).

Together, these shifting dynamics lead retailers to work harder to develop private labels, resulting in exponential growth in the area as measured by both revenue and market share. Dollar volume of private labels in mass retail grew 41 percent from 2014 to 2019, but only 7.4 percent for national brands. Sales volume rose 33.2 percent compared to a 1-percent gain for national brands. In 2018, private-label dollar sales increased 9.8 percent and volume increased 10.6 percent, while national brands lost 1.3 percent (Nielsen, 2019). Walmart, Target, Kroger, Amazon, and Albertsons all introduced new private-label products in 2018.

1.2.3 The Private-label Process

Establishing a private-label product begins with designing and sourcing it. Retailers can source private-label products through their production facilities or by outsourcing production to suppliers, which can be dedicated private-label manufacturers or manufacturers of branded products. In a category, such as cereal, with a high fixed cost of production, retailers tend to exclusively outsource private-label production rather than producing it inhouse. In the CPG industry, finding a private-label supplier often starts with approaching a national brand manufacturer (for example, Costco approached P&G to make private-label diapers) or with going to the annual two-day Private Label Manufacturer Association Trade Show, where private-label manufacturers of all sizes, nationalities, and capabilities can exhibit and retailers can see and test out products. In 2018, 36 private-label cereal manufacturers participated in the show, ranging from Post Cereal (US) to Agroindustrias Osho Sac (Peru). After initial meetings, retailers can invite the private-label manufacturers to bid on contracts. Relationships can last

anywhere from months to decades. Contracts range in complexity from simple deals for basic production to more involved contracts for full collaboration between the manufacturer and the retailer at each stage, including design, marketing, and packaging.

Key terms negotiated between suppliers and retailers include price, quality, and the level of service. These negotiations can occur formally, during a request for proposal (RFP), or informally. Most often, the process begins with an RFP in which the retailer sets forth its requirements; in RTE cereals, the retailer would indicate the desired nutrition (for example, no artificial coloring), price, package size, and terms of delivery and payment. Potential manufacturing partners then submit bids and the retailer selects one.[4]

In the RTE cereal category prior to 2007, no national brand manufacturer also makes private-label products and Ralston, the largest private-label producer, has more than 60 percent of market share. The distant second is Gilster-Mary Lee, which makes private labels often described as using "low-quality inputs," offering "poor emulations," and having "sub-par" quality and service (Simons *et al.*, 2019). Other domestic private-label suppliers in the US are insignificant in market share. International suppliers are also negligible in market share and lack meaningful name recognition in the US, as retailers strongly prefer sourcing private labels from domestic suppliers.[5]

1.2.4 Dual Tracking: A Natural Experiment

My goal is to examine the impact of vertical co-opetition between manufacturers and retailers. The merger between Post and Ralston on November 15, 2007, presents a natural

[4] Occasionally, retailers will give a manufacturer an opportunity to improve on its bid.
[5] In 2018, there were 38 dedicated private-label cereal producers, all small manufacturers except Ralston. In addition, there are also manufacturers that make generic cereal products such as Malt-O-Meal.

experiment to study this question. The deal was valued at $1.65 billion, with a closing date on August 4, 2008 (Lazarus, 1995; Dorfman, 2007).

While Post Cereal Holdings makes well-known products, such as Cocoa Pebbles, consumers know little about Ralston, as its products are under the retailers' names. Post was founded by C. W. Post in 1895 in Battle Creek, Michigan, and became part of Kraft Foods in 1989. After Irene Rosenfeld became CEO of Kraft Foods in June 2006, she launched a massive turnaround effort to revitalize sales and shed slow-growing divisions (Press, 2007). As part of this strategy, Kraft exited peripheral businesses to focus on segments in which Kraft ranked either first or second in market share (Dorfman, 2007). Because Post Cereal Holdings ranked third in the cereal category, significantly behind Kellogg's and General Mills, it was marked for exit by its parent company Kraft.

Ralston traces its ancestry to 1898, when Purina Mills, founded by William H. Danforth, began making breakfast cereal (Lazarus, 1995; Hamilton, 1996). After Kraft Food decided to exit the cereal category, Ralston merged with Post Holdings to create a company that combined brand and private-label production—a dual-tracker.

From the retailers' perspective, whom I study, the merger is exogenous given that they neither had influence on the merger nor had prior knowledge. Additionally, the merger was initiated by Post's parent company's decision to exit categories that did not meet the number-one or number-two criteria. This suggests that the cause of Kraft's exiting from cereals was driven by corporate policy and not due to the dynamics specific to the cereal industry. Furthermore, M&A events are often kept secret before the formal announcement. Because M&A's secrecy, the strategy and finance literatures have traditionally treated such events as exogenous when measuring impact (see (Zollo & Singh, 2004) on firm performance; (Siegel & Simons, 2010) on

employee mobility; (Makri, Hitt & Lane, 2009) on innovation; and (Morck & Yeung, 1992) on abnormal returns). Compared to stock analysts and investors, retailers have even less ability and motivation to anticipate a merger and act on it.

Note that because retailers can choose their private-label manufacturers, it is possible that after the merger, some retailers may switch from Post-Ralston. Making this change, however, will take time and is unlikely to impact dynamics in the short term. In addition, based on qualitative evidence from interviews with Ralston executives, Ralston is the only firm that has the technology and logistics capability to supply high-quality private-label products at scale (Piec, 2019; Vogel, 2019).

1.3 Hypotheses and Theory

Vertical relationships between manufacturers and suppliers have been studied largely through the lens of bargaining models (Draganska, Klapper & Villas-Boas, 2010; Meza & Sudhir, 2010). This approach predominantly focuses on the pairwise interactions between partners, with less consideration of rivals and of boundary conditions under which vertical co-opetition results in the greatest impact.

1.3.1 Vertical Cooperation's Impact on Performance

When manufacturers' branded products compete against retailers' private-label products, changes to the manufacturer-retailer relationship—such that they now also cooperate on developing private-label products—can affect both the vertical dynamics between these partners and the horizontal dynamics between the branded rivals.

The merger of Post and Ralston propels Post into the private-label space and tilts its relationship with retailers towards cooperation as they now jointly develop private-label products.

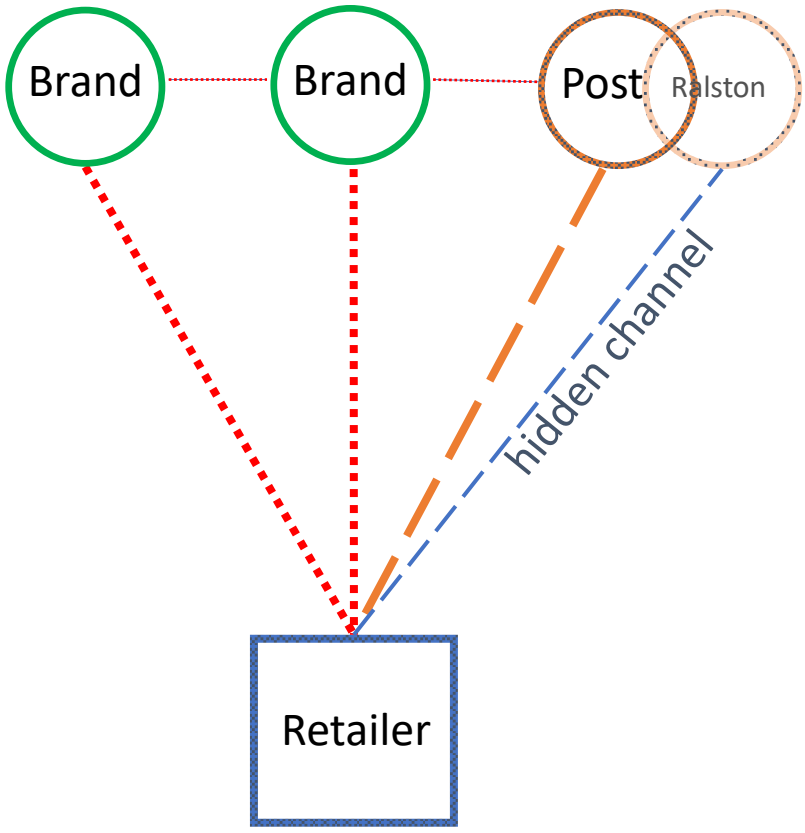


Figure 1.1. Relationship diagram (note: the red dotted line indicates a mostly competitive relationship. Brand represents other branded rivals to Post

This merger, illustrated by Figure 1.1, changes the dynamics between Post-Ralston, its branded rivals, and the retailers by aligning Post-Ralston's incentives closer with that of the retailers. Prior to the merger, Post had a mostly competitive relationship with the retailers because the retailer owned private label products competed directly against Post's branded products. However, after the Post-Ralston merger, Post-Ralston's relationship with retailers changes as it is now in both the retailers' and Post-Ralston's best interest to increase private label cereal sales. This alignment in incentives creates a hidden channel (indicated by the blue dotted line in Figure 1.1) that connects Post-Ralston and the retailers. After the merger, when the retailers formulate their private label strategies, they may consider the incentives of their private label manufacturing partner Post-Ralston.

For Post-Ralston, although helping retailers develop and produce private-label products can be profitable in itself, private-label cereal products are mostly low-margin commodities. In contrast, branded cereal products enjoy high profit margins over 40 percent (Nevo, 2001). Holding volume constant,[6] Post-Ralston is incentivized to increase sales of its branded products and shift consumers who would have purchased the private label versions of its branded cereals. This strategy, however, requires the cooperation of the retailers, which independently set their private label strategies.

Research suggests that cooperating with retailers on private-label products can enhance the manufacturer—retailer relationship in the form of additional shelf space (ter Braak *et al.*, 2013). But, whether the retailer is willing to alter its own private label strategy in consideration of its private label manufacturing partner is unknown.

For retailers, private-label products create value through two main mechanisms: additional bargaining power against manufacturers and added margins. When Post-Ralston cooperates with a retailer on private-label products, the retailer's ability to use private-label products to bargain against Post-Ralston diminishes. But, the appeal of private label products' high margin remains. Specifically, coordinating with Post-Ralston can potentially lead to increased private label sales in the entire cereal category.

Two important aspects of coordination between the retailers and Post-Ralston is new product introduction and in-store product advertisement. First, coordination between Post-Ralston and the retailers would suggest retailers will introduce relatively less new private label product that directly compete against Post-Ralston versus other branded manufacturers (i.e., General Mills, Kellogg's, PepsiCo.). I therefore hypothesize:

[6] Sales volume of branded products is significantly higher than that of private labels.

Hypothesis 1a: Co-opetition between Post-Ralston and the retailers creates a hidden channel that reduces retailer introduction of private-label counterparts to Post-Ralston's branded products in comparison to private-label counterparts to other branded products.

Second, as in-store advertising is positively correlated with sales (Dube, Hitsch & Manchanda, 2005; Berning, Huang & Rabinowitz, 2013; Longacre *et al.*, 2017), coordination between retailers and Post-Ralston would suggest a relative reduction in in-store advertisement of private-label counterparts to Post-Ralston's branded products compared to that of other branded rivals. I therefore hypothesize:

Hypothesis 1b: Co-opetition between Post-Ralston and the retailers creates a hidden channel that reduces retailer promotion of private-label counterparts to Post-Ralston's branded products in comparison to their promotion of private-label counterparts to other branded products.

In addition to adjusting the relative level of new product introductions and in-store advertisements, retailers may change its private label strategy in favor of Post-Ralston via other means (e.g., shelf space allocation). Unfortunately, my data does not allow me to measure such aspects. Nevertheless, the combined effect of changes in a retailer's private label strategy can be measured using changes in relative aggregated sales performances. I hypothesize that coordination between the retailers and Post-Ralston will lead to a relative decrease in sales of private label products that copy Post-Ralston versus other branded manufacturers.

Hypothesis 2: Co-opetition between Post-Ralston and the retailers reduces sales for private-label counterparts to Post-Ralston's branded products compared to sales of private-label counterparts to other branded products.

1.3.2 *Retailers' Private-label Portfolio Size as a Moderator*

Private-label products are valuable to retailers at both the category and firm levels. At the category level, they can enhance the retailer's bargaining position against manufacturers and provide greater margins. More importantly, at the retailer level, private-label products in the form of an umbrella brand is valuable as a point of differentiation (PLMA, 2015); as shoppers

become increasingly loyal to where they shop, an umbrella private-label brand can help attract and keep them.

The value of a private-label umbrella brand, like that of any reputational resource, must be protected. Changes or weakness in any specific private label product or category can signal to consumers about the entire umbrella brand (Wernerfelt, 1988; Montgomery & Wernerfelt, 1992; Erdem, 1998). A retailer should, therefore, evaluate changes to its private-label strategy in any single category with respect to potential effects on the overall brand.

Additionally, private-label products under an umbrella brand share not only reputational but also physical resources. Statically, it has been found that umbrella branding generates savings in brand development and marketing costs over time (Tauber, 1981; Lane & Jacobson, 1995). More dynamically, private-label brands can benefit from each other's advertising and promotions via spillovers (Erdem & Sun, 2002). Hence, changing strategies (i.e., limiting private label introductions or promotions) in favor of a specific manufacturer can undermine a retailer's overall private label strategy.

Due to risks associated with changing private label strategies, a retailer with a large private label portfolio and strong umbrella brand resources will be less likely to alter its strategy to take advantage of gains in a particular category. I therefore hypothesize:

Hypothesis 3: The impact of the hidden channel is stronger for retailers with a small number of private label products, ceteris paribus.

1.4 Data

My primary source of data is a consumer scanner database at the US store level from Information Resources Infoscan (IRI), which tracks product sales information in 31 categories at individual stores in 50 cities from 2004 to 2011. This sample represents roughly 5 percent of the products sold in the continental US each year. It does not include stores that sell only private

labels, such as Aldi, which account for 2 percent of the grocery sector (Boyle, 2018). Table 1.1 shows that private-label market share can range widely depending on the product category. For example, the private-label market share is 0.03 percent for beer and alcoholic beverages but 69.1 percent for milk.

Table 1.1: Private label penetration by product category.

Category	2001	2006	2011
beer/ale/alcoholic cid	0.0002	0.0001	0.0003
blades	0.109	0.111	0.165
carbonated beverages	0.126	0.121	0.143
cigarettes	0.016	0.010	0.002
coffee	0.116	0.114	0.139
cold cereal	0.107	0.132	0.155
deodorant	0.005	0.002	0.001
diapers	0.254	0.223	0.236
facial tissue	0.228	0.269	0.346
frankfurters	0.079	0.078	0.062
fz dinners/entrees	0.011	0.008	0.026
fz pizza	0.081	0.104	0.136
household cleaner	0.059	0.060	0.107
laundry detergent	0.055	0.050	0.056
margarine/spreads/butt	0.128	0.096	0.102
mayonnaise	0.125	0.123	0.162
milk	0.684	0.683	0.691
mustard / ketchup	0.215	0.252	0.313
paper towels	0.285	0.400	0.462
peanut butter	0.229	0.236	0.266
photography supplies	0.158	0.130	0.185
razors	0.021	0.035	0.066
salty snacks	0.088	0.082	0.099
shampoo	0.037	0.026	0.027
soup	0.105	0.121	0.121
spaghetti/italian sauc	0.058	0.087	0.122
sugar substitutes	0.119	0.110	0.174
toilet tissue	0.223	0.268	0.315
toothbrush/dental acce	0.153	0.165	0.206
toothpaste	0.001	0.002	0.004
yogurt	0.185	0.184	0.169

Private label penetration refers to the percent of sales (in units) for private label items over the total number of items sold in each cateogry for each year. My dataset ranges from 2001 to 2011. Data source: IRI Infoscan.

In my main sample, I subset the scanner data to include only RTE cereal products manufactured by the four leading manufacturers, which account for over 80 percent of market share. This dataset is an appropriate sample to study the effect of co-opetition on performance because it simultaneously provides sales information of both the brand and the private-label

products.[7]

Table 1.2: Summary statistics.

Statistic	Mean	St. Dev.	Min	Max
Sales (units)	463.67	652.85	1	22,889
Point-of-sale ads (units per week)	0.97	3.23	0.00	88.00
Private label resources (pct)	0.14	0.05	0.001	0.26
Price (dollars)	2.37	0.68	0.38	14.33
Store sales (mln)	26.01	15.28	2.02	146.24
Discounts (units)	0.10	0.69	0.00	18.00
Consumer Income (thou)	43.54	8.40	28.04	64.82
Retailer competition (rival stores)	19.72	13.23	1.00	69.11

Data represent 2.8 million observations, 375 products, 2,062 stores, 109 chains, spanning 2004-2011 at the product-store-year level.

Evaluating the impact of manufacturer–retailer cooperation at the product level is usually quite challenging because it is difficult to match branded with private-label products. This is because virtually all scanner data providers mask the retailer identity for contractual reasons. For this analysis, it is helpful that I can manually match brands with their private-label counterparts based on similarities in the product description. This method is especially effective for highly differentiated categories with many products. For example, General Mills Honey Nut Cheerios carries the description of "HYNCH HNYNT OAT" (Honey Nut Cheerio Honey Nut Oat). As this description is identical to the description of a unique private-label product, I manually match the two products.[8] The final dataset contains matched products over the years 2004 to 2011.[9]

[7] Note that only 92 out of 15,888 store-year observations (0.6 percent) did not include any private-label cereal products.

[8] Descriptions for both the private-label and the brand name can sometimes be general. For example, both Kellogg's Apple Jacks and Kellogg's Morning Jump Starts carry the description "APLCN 3GRNN BX." Since it is more likely that a private-label brand was created to correspond to the leading brand than to a minor brand, I assume that, for example, "APLCN 3GRNN BX" is a private-label counterpart to Kellogg's Apple Jacks rather than to the much less popular Kellogg's Morning Jump Starts.

[9] I aggregate at the year level because cereal sales tend to be seasonal. Aggregating at the year level smooths out some seasonal patterns.

Table 1.3: Matching statistics for brand product and PLB.

Description	Value
Unique brand product descriptions: 4 leaders	1,066
Unique PLB descriptions	1,434
Total matched brand - PLB	663
Exact matched brand - PLB	392
Manual matched brand - PLB 90 % similarity and above	148
Manual matched brand - PLB 70 % similarity and above	123

Data is aggregated across all stores in the sample. Unique brand product descriptions are unique occurrences of product descriptions for the largest 4 manufacturers (GM, KL, PO, Pep). Unique PLB descriptions are for all private label products. Container size are ignored when identifying unique product descriptions. Different brand product container type may be matched to the same PLB product.

1.5 Empirical Models and Results

1.5.1 *Defining Retailers' Private-label Portfolio*

To measure the size of a retailers' private-label portfolio, I first calculate the market share of private-label products for each category in each store. Next, for each store in each year, I calculate the average private-label market share across all categories. Finally, I find the average private-label market share for each chain across all its stores.

1.5.2 Defining Retailer Competition

Retailer competition is defined by how close stores are to each other. However, for contractual reasons, no scanner data provides exact store locations or identities. Instead, it provides the store's ZIP code. The 1,712 stores in my sample are spread across 1,449 ZIP codes, suggesting that distance between ZIP codes is a good proxy for distance between stores.

Table 1.4: Retailer statistics.

Description	Value
Number of stores	1,712
Number of chains	109
Number of zip codes	1,449

Summary statistics for retailers.

Using the center for each ZIP code to proxy each store's location,[10] I measure the pairwise distance between each combination of stores. Then, I define a 50-mile radius around each store and I count the number of stores within the radius belonging to the same chain or to a rival chain. Summary statistics presented in Table 1.2 indicate that on average, a store has 19 competing stores from rival chains within a 50-mile radius.

1.5.3 Empirical Models and Results

To explore the impact of vertical co-opetition, I use a difference-in-differences approach. The main empirical specification is of the form:

$$Y_{ijt} = \beta_0 + \beta_1 \times Hidden\ channel_i + \beta_2 \times Merger_t + \beta_3 \times Hidden\ channel_i \times Merger_t + X_{ijt}B + \phi_i + \zeta_j + \eta_t + \varepsilon_{ijt}, \quad (1)$$

where Y_{ijt} is the dependent variable of interest (e.g., new product introduction, number of in-store advertising units, and sales) for private-label product i in store j in year t. $Hidden\ channel_i$ is a dummy equal to 1 if the product is a Post-Ralston branded product, $Merger_t$ is a dummy equal to 1 after Ralston merged with Post, X_{ijt} is a vector of control variables (such as price), ϕ_i is a product fixed effect, ζ_j is a store fixed effect, and η_t is a year fixed effect. Product and store fixed effects control for fixed differences across products and stores, while the year fixed effect controls for common macroeconomic shocks. Standard errors are clustered at the market-year level.

[10] ZIP codes are defined based on population density and can cover an area ranging from one-tenth of a square mile (e.g., Long Island City) to 10,000 square miles (Tonopah, Nevada).

Table 1.5: Effect of co-opetition on private label introduction.

	(1)	(2)	(3)
Hidden channel × merger	−0.076	−0.076	−0.076
	(0.018)	(0.018)	(0.018)
Lag price	0.003	0.003	0.004
	(0.003)	(0.003)	(0.003)
Discounts	0.009	0.009	0.009
	(0.003)	(0.003)	(0.003)
Point-of-sale ads		−0.0001	−0.0001
		(0.0004)	(0.0004)
Adv. spending			0.00000
			(0.00000)
Observations	33,460	33,460	33,460
R^2	0.794	0.794	0.794
Note:			p<0.1; p<0.05; p<0.01

Dependent variable is the probability of introducing private label product counterpart to brand product i in store j in year t. *Hidden channel* is an indicator variable for private-label products that emulate Post Holdings cereals products, *Merger* is an indicator variable for the merger of Post Holdings and Ralston corp. Lag price in dollars per pound for the previous year, Point-of-sale ads is the number of in store advertisements, discount is the number of coupons and rebates, adv. spending in millions. All models include product, store, and year fixed effects.

Following the empirical specification above, Table 1.5 shows the effect of the hidden channel on the probability of introducing private label product counterparts to branded products. The dependent variable is binary, where 0 indicates that for a store-year, only the branded version of product i is sold in both 2006 and 2009. On the other hand, 1 indicates that for a store-year, while only the branded version of product i is sold in 2006, both branded and its private label counterpart is sold in the store in 2009. Table 1.5 shows that post-merger, retailer effort to introduce private-label counterparts to Post-Ralston products decreased, supporting Hypothesis 1a.

Table 1.6: Effect of co-opetition on private label promotion.

	(1)	(2)	(3)
Hidden channel × merger	−0.476	−0.690	−0.677
	(0.140)	(0.159)	(0.159)
Price lag	−0.174	−0.168	−0.169
	(0.052)	(0.053)	(0.052)
Discount	0.084	0.096	0.094
	(0.074)	(0.094)	(0.094)
Adv. spending		−0.00001	−0.00001
		(0.00000)	(0.00000)
Estimated sales			−0.015
			(0.006)
Observations	51,054	34,839	34,839
R^2	0.229	0.287	0.287
Note:			p<0.1; p<0.05; p<0.01

Dependent variable is the number of in store advertisement for private label version of product i in store j in year t. t. *Hidden channel* is an indicator variable for private-label products that emulate Post Holdings cereals products, *Merger* is an indicator variable for the merger of Post Holdings and Ralston corp. Lag price in dollars per pound for the previous year, Discount is the number of coupons and rebates, adv. spending in millions, Estimated sales is the estimated annual sales for the entire store in millions. All models include product, store, and year fixed effects.

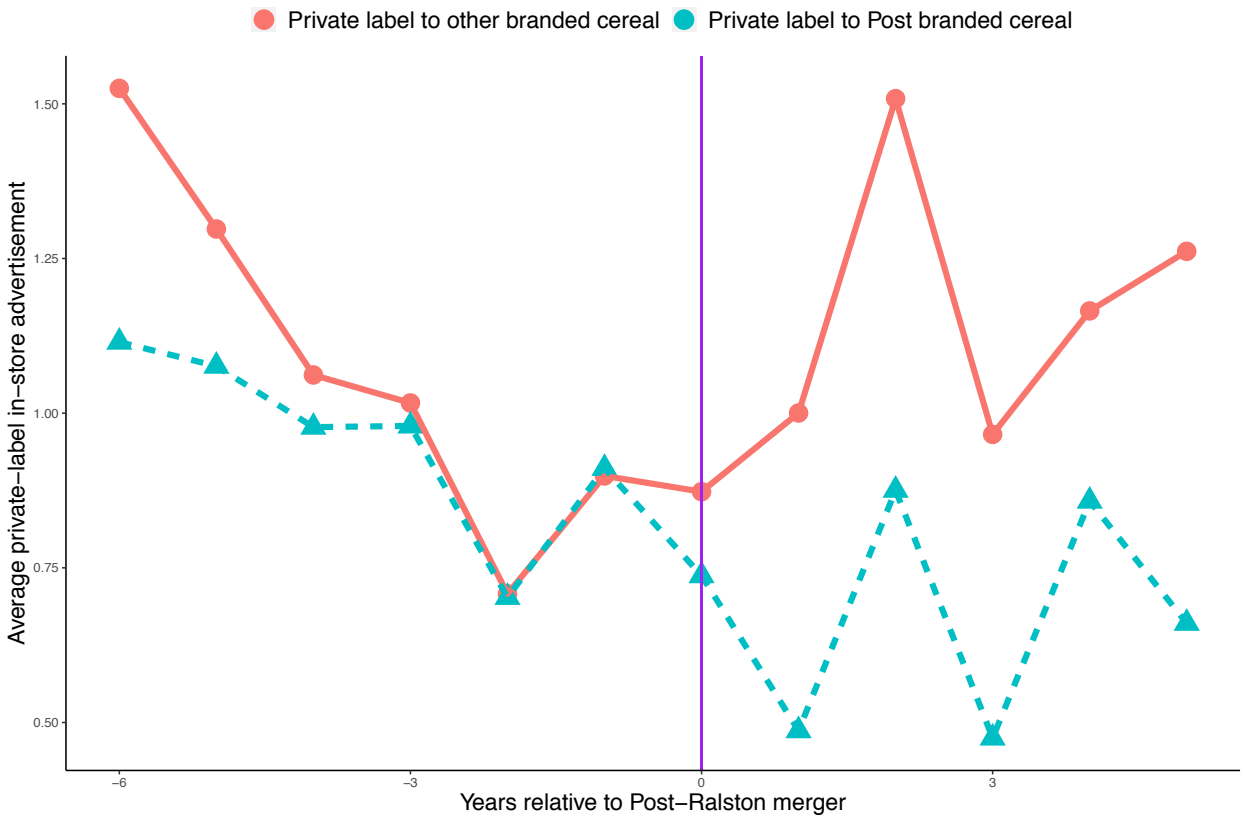


Figure 1.2. Private label in-store advertisement level.

Table 1.6 and Figure 1.2 show that post-merger, promotion of private label products via in-store displays for private label products that emulate Post-Ralston versus other brands decreased, supporting Hypothesis 1b. Specifically, stores decreased their level of in-store advertisements for private label products that emulate Post-Ralston relative to products that emulate General Mills, Kellogg's and PepsiCo. Table 1.6 applies the empirical specification above and Figure 1.2 plots the average private label in-store advertisements.

Table 1.7: Effect of co-opetition on private label performance.

	(1)	(2)	(3)	(4)
Hidden channel × merger	−0.398	−0.607	−0.323	−0.295
	(0.057)	(0.100)	(0.087)	(0.073)
Hidden channel × merger × low				−0.358
				(0.079)
Lag price	−0.336	−0.295	−0.314	−0.324
	(0.026)	(0.038)	(0.039)	(0.027)
In-store display	0.055	0.068	0.051	0.056
	(0.003)	(0.005)	(0.003)	(0.003)
Discount	0.100	0.174	0.081	0.103
	(0.012)	(0.025)	(0.011)	(0.012)
Adv. spending	0.00000	0.00001	0.00000	0.00001
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Estimated sales	0.007	0.003	0.006	0.006
	(0.002)	(0.004)	(0.002)	(0.002)
Income	−0.001	0.024	−0.0001	0.002
	(0.006)	(0.012)	(0.008)	(0.006)
Retailer competition	−0.005	−0.013	−0.005	−0.005
	(0.004)	(0.006)	(0.006)	(0.004)
Observations	92,277	34,802	52,349	86,541
R^2	0.558	0.566	0.577	0.561

Dependent variable is log sales of private label product i in store j in year t. *Hidden channel* is an indicator variable for Post Holdings cereals products, *merger* is an indicator variable for the merger of Post Holdings and Ralston corp. Price in dollars per pound, in store display is the number of in store advertisements, discount is the number of coupons and rebates, adv. spending in millions, store sales is the estimated annual sales for the entire store in millions, income is the per capita income, *Retailer competition* is the average number of rival stores within 50 mile radius of the focal store, aggregated at the chain level. Model (1) use the entire sample. Model (2) subsets to stores in chains with below the median level of private label market share for each year, Model (3) subsets to stores in chains with above the median. All models include year, store, and product fixed effects. Standard error clustered at the market-year level.

Table 1.7 presents results measuring the effect of the Post-Ralston merger on performance following the empirical setup discussed in the previous section. I create a dummy variable *low* to indicate chains with a small private label portfolio of products across all categories using the approach discussed in section 5.1. Specifically, I identify chains above (below) the median private label portfolio. Columns 1 and 4 use the full sample while columns 2 and 3 subset the full sample based on the *low* indicator variable.

All models show that post-merger, sales of private-label counterparts to Post-Ralston products decreased relative to counterparts to other branded products, supporting Hypothesis 2. Furthermore, the triple interaction in column 4 indicates that the relative decrease in performance is more significant in retailers with a small portfolio of private label products versus in retailers with a large portfolio, supporting Hypothesis 3.

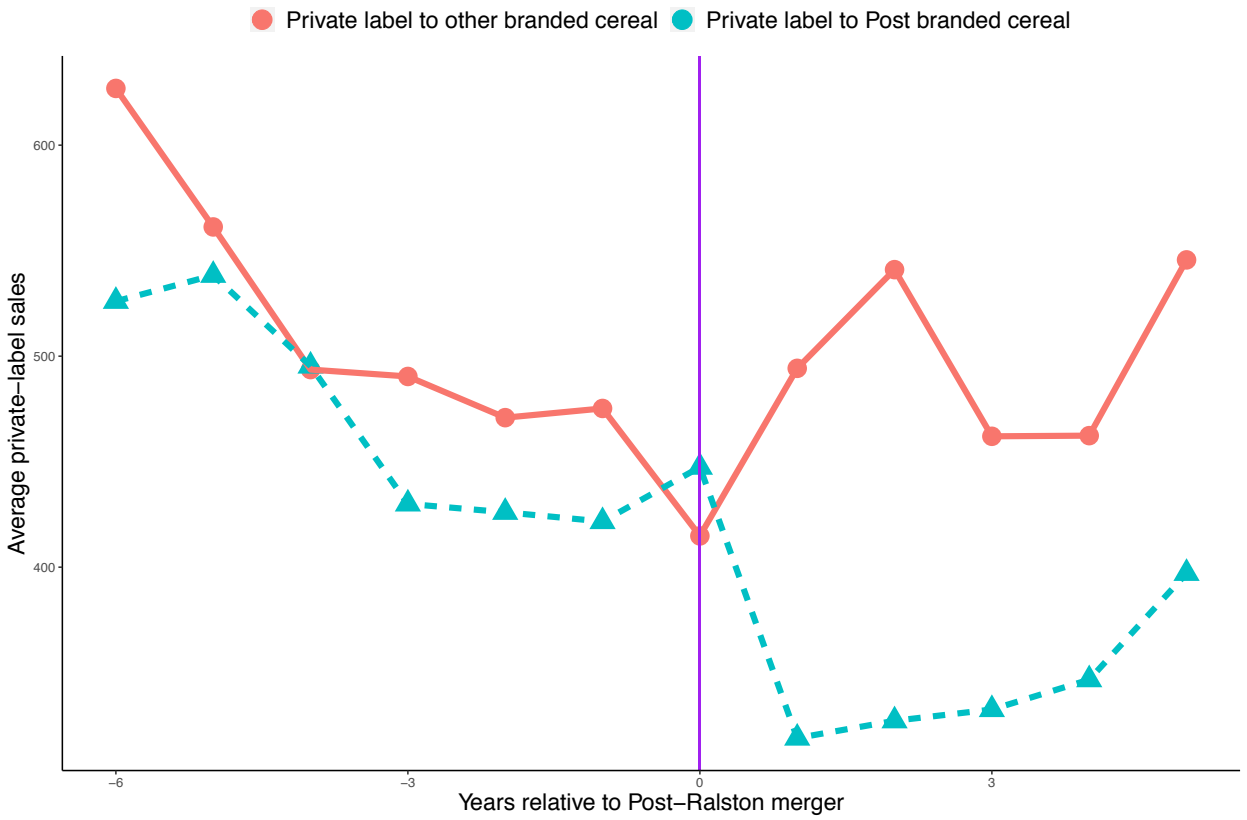


Figure 1.3. Private label product sales performance.

Figure 1.3 plots the performance of private label products that emulate Post-Ralston versus those that emulate General Mills, Kellogg's, and PepsiCo. The sharp divergence in sales also supports Hypothesis 2.

1.5.4 *Robustness*

As the difference-in-differences analysis hinges on the parallel trends assumption, I conduct pre-trends robustness analysis for my main results in Table 1.7 by individually testing for pre-merger statistical differences between Post-Ralston products and non-Post-Ralston products across all years (Seamans & Zhu, 2014). Specifically, I extend the main specification used for Table 1.7 by including the interactions between $Hidden\ channel_i$ and each of the year dummy variables.

Table 1.8: Non-inferiority model assumption tests for performance.

	(1)	(2)	(3)	(4)
Hidden channel × 2005	−0.089	−0.026	−0.115	
	(0.045)	(0.065)	(0.055)	
Hidden channel × 2006	−0.085	0.013	−0.127	
	(0.052)	(0.102)	(0.060)	
Hidden channel × 2007	−0.054	0.041	−0.206	
	(0.064)	(0.127)	(0.067)	
Hidden channel × low × 2005				0.121
				(0.086)
Hidden channel × low × 2006				0.115
				(0.115)
Hidden channel × low × 2007				0.273
				(0.138)
Observations	49,276	20,327	29,401	49,276
R^2	0.607	0.614	0.638	0.609

I conduct non-inferiority model assumption tests for Table 7 using only pre-merger data.

Table 1.8 shows that the parallel trends assumption appears to hold more so for models 1, 2 and 4 than for model 3.

To test the sensitivity of my main result with respect to potential parallel trends violations, I conduct sensitivity analysis for my main result in Table 1.7 (model 1) following Bilinski and Hatfield (2018). Specifically:

$$\ln(sales)_{ijt} = \sum_{k=T_0}^{T} \beta_k \mathbb{1}\left(t = k \cap D_{b(i)} = 1\right) + f\left(tD_{b(i)}; \phi\right) + X_{ijt}B + \psi_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (2)$$

Where $\ln(sales)_{ijt}$ is the log(unit sales), $D_{b(i)}$ is a dummy variable indicating private label products that copy Post Cereal products, $X_{ijt}B$ is a vector of control variables, ψ_i, γ_j , η_t are product, store, and year fixed effects, and $f\left(tD_{b(i)}; \phi\right)$ controls for pre-period trend differences linearly. The results in Table 1.9 show that my estimates are insensitive to potential violations to the parallel trends assumption.

Table 1.9: Sensitivity analysis.

	(1)	(2)
Hidden channel × T0	−0.021	0.086
	(0.028)	(0.035)
Hidden channel × T1	−0.526	−0.364
	(0.032)	(0.051)
Hidden channel × T2	−0.445	−0.232
	(0.035)	(0.059)
Hidden channel × T3	−0.519	−0.254
	(0.038)	(0.073)
Hidden channel × T4	−0.239	0.078
	(0.033)	(0.083)
Hidden channel × T5	−0.261	0.107
	(0.037)	(0.095)
Observations	92,277	92,277
R^2	0.558	0.558
Note:		p<0.1; p<0.05; p<0.01

Model 1 is the baseline model for low private-label equity for comparison. Following (Bilinski and Hatfield, 2018), model 2 estimates the effect of the hidden channel by including a linear time trend.

1.6 Discussion and Conclusions

In this paper, I examine the impact of vertical co-opetition between manufacturers and retailers. Using a difference-in-differences approach, I show that in response to cooperation between the brand manufacturer (Post-Ralston) and the retailers on private-label products, sales of private-label counterparts to Post-Ralston products decreased, especially in retailers with low private-label resources across categories. This decrease in private-label performance is due, in part, to retailers' decreased effort to introduce and promote their own private-label counterparts to Post-Ralston products. Together, these results suggest that vertical cooperation between Post-Ralston and the retailers reduced competition between the vertical partners via a hidden channel of aligned incentives.

Because my measures are relative to branded products owned by rival manufacturers, my results show that cooperation with Post-Ralston led Post-Ralston and the retailers to steal business from other branded rivals.

Finally, I explore the effect of a retailer's existing level of private-label product portfolio on its willingness to cooperate with brand manufacturers on private-label products. I find that when the retailer has built up a significant private-label product portfolio spanning multiple categories, it is less likely to alter its private-label strategy in a particular category (such as cereals). Understanding how firms trade off the gains from business stealing with the risks of upsetting an overarching private-label strategy is important to both the strategy literature and to practitioners. In the latter case, it can help managers decide how to properly invest in private label products and build strong manufacturer-retailer relationships.

It is important to note that this study focuses on a particular industry with a rich set of differentiated products but limited scope. This limits my ability to distinguish among alternative

hypotheses. Nonetheless, despite these and other challenges, this analysis of vertical co-opetition between suppliers and retailers offers insights into their strategic interactions.

Finally, my analysis addresses recent antitrust concerns regarding e-commerce platforms, such as Amazon, unfairly promoting their own private-label products (Mattioli, 2019). Regulators are concerned with ways which large e-commerce retailers such as Amazon and Walmart can abuse their market power. In each case, the e-commerce retailer has promoted its private labels by changing the search algorithm and displaying its own private-label products more prominently in search results. Walmart also created special icons, such as "organic," just for its own private labels, even though competing branded products are also organic. Applying the offline dynamics examined in this paper to online contexts can be a valuable extension and a natural next step.

Chapter 2

Pushed into a Crowd: Repositioning Costs, Resources, and Competition in the RTE Cereal Industry

2.1 Introduction

How should a firm respond to the entry of a powerful competitor? Should the firm reposition, maintain its current position, or even exit? The choice turns on both the level of ensuing competition and the value of the firm's competitively-relevant resources. While the impacts of changes in competition intensity have received much empirical attention in the strategy literature, less attention has been given to changes in the value of resources.

In this paper we exploit a natural experiment resulting from the introduction of self-regulation in the U.S. ready-to-eat (RTE) breakfast cereal industry. The regulation circumscribed key product and marketing choices which, in turn, induced changes in positioning of some cereal products. The cereal setting has two features that make it especially useful to study. First, changes in position are easy to observe and measure because the regulatory shock that induces repositioning is narrowly tailored to the sugar levels of the cereal products. Second, the children's RTE cereal market is populated with numerous differentiated products for which positioning, pricing, sales and advertising are all observable. The granularity of this data allows us to generate a series of findings regarding (1) the impacts of the involuntary repositioning of high-sugar cereals on product and firm performance, (2) the nature and value of brand equity for products in this market and how that value is affected by product repositioning, and (3) the responses of firms to changes in the competitive environment.

Because the factors animating managerial choice at the product level are similar to those animating business unit choice, our work contributes to the strategy literature addressing firm responses to entry and other changes to the competitive environment. Within this literature scholars have examined firm responses involving repositioning (Wang & Shaver, 2014; Menon

& Yao, 2017; Du, Li & Wu, 2019), diversification (Bowen & Wiersema, 2005), exit (Dobrev & Kim, 2006), exit followed by new entry (de Figueiredo & Silverman, 2007), differentiation (Gimeno, Chen & Bae, 2006; Flammer, 2015), and investments (Ethiraj & Zhou, 2019). In linking product-level positioning, product-specific resources, and performance, we focus primarily on repositioning and differentiation.

The RTE breakfast cereal industry ("cereal industry") is an oligopoly with four dominant firms, each selling products differentiated by characteristics such as taste, nutrition, and image. Differentiation is reinforced through substantial advertising with industry expenditures running about 13 percent of sales (Nevo, 2001). In the children's segment of the market, taste and, in particular, sweetness, was so important, that sugar was once characterized as the "magic fairy dust" of the age.[11] But excessive sugar in a child's diet has a big nutritional downside because it contributes to childhood obesity.

This downside and the attendant public pressures resulted in the launch of the cross-industry Children's Food and Beverage Advertising Initiative (CFBAI) in late 2006 to address childhood obesity. As participants in this initiative, all of the dominant cereal firms agreed not to advertise to children cereal products containing more than 12 grams of sugar per serving. The agreement addressed advertising, the primary marketing lever for selling those products, and sugar, the most important ingredient generating sweetness. The advertising constraint was binding and significant. While not all children's cereals were directly affected, some cereals required a 25 percent or greater reduction of sugar to meet the standard. All of the directly affected products ("constrained products") lowered sugar rather than cease advertising to children. Because all CFBAI firms complied with the Initiative (Lee, Kolish & Enright, 2010;

[11] Traig (2019). Many prominent cereals previously featured sugar in their brand names. These included Sugar Crisp (now Golden Crisp), Sugar Frosted Flakes (now Frosted Flakes), and Sugar Chex (now Honey Nut Chex).

Enright, 2018), there was no difference between self-regulation and regulation in terms of impacts. Hence, going forward we refer to the restrictions as "regulations."

Our first set of findings assess the performance impact of regulation on products and firms. We find that the constrained products on average experienced 16 percent lower sales and a four percent lower price performance relative to unconstrained products, products not explicitly targeted by the regulations. We observe that unconstrained products were indirectly affected by changes in competition associated with changes to constrained products. Aggregating to the firm level, firms with more constrained products performed worse than less constrained firms.

The next set of findings provides insight into changes in the value of brand equity resources when products are repositioned. We distinguish between brand equity specific to the product and brand equity that applies to all of a firm's products and provide evidence that firms in this industry invest more heavily in product-specific brand equity relative to firm-specific brand equity. We then estimate that repositioning associated with a 7 to 10 percent reduction in sugar led to an average sales decline of 3.5 percent.

The third set of findings characterize how competition and brand equity deterioration considerations affected exit, repositioning, and investment in brand equity through advertising. The raw numbers show substantial exit after regulation: the number of advertised product and product variants per year decreased from 26 to 19 compared with an almost 30 percent increase of products in the adult segment. Unsurprisingly, exit of constrained products was more likely if the initial sugar level of the products was higher. Repositioning, operationalized as an increase in advertising addressed to adult versus children's segments, was 20 percent more likely with the addition of each additional close competitor. There is also weak evidence that repositioning is more strongly influenced by cannibalization of own products than competition from rival

products. Finally, we find that repositioning of constrained products resulted in an increase in per product advertising from $5.5 million to $6.6 million in the children's segment, compared with a slight decrease in the adult segment. Using a measure of the intensity of competition, we also find that advertising expenditures increased by 17 percent on average per product with each additional close competitor. We interpret these responses as attempts to expand the customer-perceived product space by creating increased image differentiation.

Overall, these findings contribute to two literatures: the literature which examines the impacts of entry and, in particular, explains how differences among products and firms lead to differences in strategic responses and the literature linking the value of resources to changes in positioning. Like other studies in the literature exploring responses to entry, we identify circumstances leading to different types of responses. Empirical studies in strategy that address these topics typically take advantage of, as we do, one or more triggering events that reduce the number of confounding factors that affect observed outcomes. For example, Bowen & Wiersema (2005) find that foreign entry leads domestic incumbents to focus on their core businesses and Flammer (2015) observes that increases in competition created through tariff reductions lead firms to differentiate through investments in corporate social responsibility. Ethiraj & Zhou (2019) find full-service airlines, but not low-cost airlines, respond to entry threats with additional investments while Wang & Shaver (2014) find a negative relationship between higher brand equity and exit. There are, in addition, many papers that examine price changes in response to entry (e.g., (Fleming *et al.*, 1996; Simon, 2005; McCann & Vroom, 2010).

These studies explore incumbent responses to increased competition, but the settings studied typically are not amenable to an assessment of performance outcomes. By contrast, our product-level analysis makes it easier to observe differential performance outcomes resulting

from differences in positioning and resource bases. Each product in our focal market has distinguishable positions and differs in terms of product-specific brand equity. In short, each product is similar to an individual business unit in terms of the factors that matter most in response to the regulatory shock and subsequent increased competition. We also consider cannibalization which would be a focus of a product-portfolio optimization.

In the literature linking the value of resources to changes in positioning, Grant (1991) and Amit & Schoemaker (1993) offer theories that link resources to the positioning of products while Aaker (2009) and Danneels (2011) do the same for brand equity resources. In terms of empirics, the literature that links the relative value of resources in light of demand-side changes in positioning has been relatively limited. That literature largely treats the values of resources determined by demand-side characteristics as exogenous to the resource-based view of firm advantage (Priem & Butler, 2001).

To our knowledge, our study offers the first empirical analysis in the strategy literature that measures in performance terms how repositioning changes the value of brand equity. We find that brand equity can be very local such that modest repositioning can be costly. With regard to brand equity and strategy, our study relates to three recent empirical papers, the first two (Wang & Shaver, 2014; Flammer, 2015) explore the value of brand equity in the context of intensifying competition and the third (Frake, 2017) measures the change in consumer perceptions resulting from an acquisition. Wang & Shaver (2014) focus on the response of incumbent television broadcasting firms to the entry of a single dominant firm, CCTV, in the Chinese television market and find that incumbents with more brand equity are less likely to reposition away from CCTV. Our analysis complements the dominant firm analysis of Wang and Shaver by examining a relatively balanced oligopoly setting where competition from all firms

must be considered. Flammer (2015) finds firms invest in brand equity in the form of CSR when competition increases because of a decline in tariffs. Both papers offer attractive analyses that establish the value of brand equity as a bulwark against competition, but neither evaluates the change in brand equity value with repositioning. The third paper, Frake (2017), shows that a craft beer's brand equity declines when the craft beer is acquired by a mainstream producer. Change in ownership is a common event that may trigger changes in consumer perceptions and may anticipate a possible repositioning of the acquired product. Frake (2017) finds the ownership change led to negative changes in consumer perceptions regarding the craft beer, though his analysis does not address the performance value changes that result with actual repositioning.

The remainder of the paper is organized as follows. Section 2.2 describes the self-regulatory initiative and then provides background about the RTE cereal market. Section 2.3 discusses relevant theories of competition-driven responses and resource transferability and applies those theories to the children's RTE cereal market. Section 2.4 describes the data and Section 2.5 provides an empirical analysis of performance impacts, changes in the value of brand equity, and strategic responses to regulation by the firms. Section 2.6 concludes.

2.2 The Childhood Obesity Problem and the RTE Cereal Market

Childhood obesity, as a major public health threat, has been characterized as "a massive tsunami headed for the United States" (Lesley, 2008). Since 1980, the rate of obesity in the United States has more than doubled in preschool children and tripled in adolescents and by 2005 about nine million young people in the U.S. were thought to be overweight (Kennedy, 2005). One cause of childhood obesity is the poor nutritional content of the food children are eating.

In the years immediately preceding the creation of CFBAI, legislation was introduced to increase funding and coordination of programs addressing childhood obesity, and the FTC and HHS held an influential public workshop to examine what the private sector might do to combat this crisis (Majoras *et al.*, 2006). Industry, for the most part, questioned the potential effectiveness of governmental regulation, raised free speech concerns (Majoras *et al.*, 2006), and lobbied to defend the food industry's right to advertise to children (Ellison, 2005). Such efforts played a major role in forestalling governmental regulation. But firms also worked towards their own solutions either individually or collectively through industry self-regulation.

2.2.1 The Children's Food and Beverage Advertising Initiative (CFBAI)

In contrast to governmental regulation, industry self-regulation is typically less invasive. Such collective action serves as a middle way between governmental regulation and the free market. But a key difference—and a key weakness—is that self-regulation is typically voluntary and lacks effective sanctions.

The Council of Better Business Bureaus (CBBB) was well-positioned to facilitate industry efforts to address childhood obesity because of its long history of self-regulation involving marketing to children. In 2005, CBBB formed a working group which ultimately led to the launch of CFBAI in late 2006. Under CFBAI, the participating firms set nutrition criteria to govern the foods they advertise to children under the age of twelve. Three of the ten founding firms were major cereal manufacturers: General Mills, Kellogg's, and PepsiCo (parent of Quaker Oats, henceforth referred to as Quaker Oats). Others included Coca-Cola, Hershey, and McDonalds. After Post joined in October 2009 (Lee, Kolish & Enright, 2010) CFBAI member firms accounted for over 80 percent of industry sales.

The nutrition guidelines for RTE cereal were focused predominantly on sugar content. General Mills, Kellogg's, and Post committed not to advertise children's cereal products that exceeded 12 grams of sugar per serving. Initially, Quaker Oats did not explicitly set a compliance level for sugar content (Kolish, 2008) and in 2010 set its sugar level at "≤ 25 percent of kcal added" (Kolish, 2008), consistent with its parent's snacks and beverage products targeted to children. General Mills initially set the most aggressive self-regulation policy (e.g., initiated compliance for some products up to a year or more before Kellogg's implementation date of December 31st 2008). Through the period of this study, the branded RTE manufacturers were in near-perfect compliance with their self-regulatory commitments, in part, because the commitments were easily observable and children's nutrition was a sensitive topic (Ellison, 2005). In 2011 CFBAI announced a lowering of the standard to 10 grams of sugar per serving with a 2013 start date (Kolish, 2011). This reduction took place outside our study period.[12]

2.2.2 The RTE Cereal Industry and Marketing to Children

In 2006 the top four manufacturers in the RTE cereal market controlled over 80 percent of the market with the remaining sales coming from private labels and smaller manufacturers who either do not advertise or do minimal advertising. To fend off competition from new entrants and private label products, manufacturers employ strategies involving continual differentiation, product proliferation, and heavy advertising. Hundreds of different cereal products were produced in a given year, each with only a very small share of the market, typically under one percent (Price, 2000). The cost of launching a new product was significant in comparison to the expected revenue and most new products failed quickly (Hitsch, 2006). Advertising plays a huge role in differentiation. In 2001, the advertising-to-sales ratio for the

[12] The food policy and medical literature (e.g., Berning, Huang & Rabinowitz (2013) and LoDolce, Harris & Schwartz (2013)) examined the effectiveness of the RTE cereal portion of CFBAI finding mixed results.

RTE cereal industry was around 13 percent, much higher than the typical two to four percent in other food industries. Nevo (2001) argues that RTE cereal firms enjoyed a high price-cost margins mainly due to their ability to differentiate their products and influence perceived product quality.

Cereals targeted to consumers under 12 years of age account for about one-third of sales and about one-quarter of advertising expenditures. These cereals are advertised directly to children who, unsurprisingly, respond to taste and cues other than nutrition. For example, LoDolce, Harris & Schwartz (2013) found that 91 percent of high-sugar cereal ads viewed by children caused the children to ascribe extraordinary powers to these products. Furthermore, even if parent purchasers have an accurate understanding of a nutritious diet and information on a cereal's nutritional content, they heavily weigh the benefits of keeping children happy and getting them to eat cereal. The final decision, therefore, is partially driven by children who exert "pester power" (Lawlor & Prothero, 2011).

2.3 The Impact of Increased Competition and Repositioning: Theory

CFBAI's regulation induced high sugar children's cereals to reduce sugar levels, effectively shrinking the available product characteristic space for children's cereals. This regulation is similar to minimum safety standards which may eliminate potentially lower-priced, lower-quality products that pose an unacceptable safety risk (Ronnen, 1991). More generally, the regulation is an example of an environmental shock that triggers repositioning of products to other segments of product space (Wang & Shaver, 2014).

Repositioning crowds other products, potentially creating increased competition for repositioned products and incumbent products alike (Crampes & Hollander, 1995). Changes to the intensity of competition and resulting performance outcomes are influenced by changes in

the number of competing products (Ronnen, 1991; Lutz, Lyon & Maxwell, 2000), how they are differentiated from one another, and changes in overall demand for these products.

One critical cost of repositioning, especially with regard to consumer products, is that repositioning may partially destroy differentiation advantages a product held at its original position, presumably because the advantages were optimized for that position. Consider, for example, product-specific brand equity. Aaker (1997) argues that a repositioned product may experience a deterioration in its brand equity because the change in the product's positioning creates a mismatch between consumer brand expectations and actual product performance.

2.3.1 Performance Impact of Increased Competition

The 12 grams standard imposed through CFBAI self-regulation induced involuntary repositioning of high-sugar products. While nominally less rigid than a product ban, the restriction on advertising was so binding that all high-sugar cereals, the "constrained" products, were either reformulated to meet the standard or discontinued. Given the central importance of sugar in children's cereals, this change in content represents a significant repositioning of those products leading to a crowding in the product characteristic space.

The impact of repositioning is somewhat subtle. Holding entry and exit fixed, repositioning increases the number of competitors in the lower-sugar part of product space. But the competition increasing effect of more competitors may be offset by an increase in demand from customers who previously bought (now unavailable) higher-sugar offerings and exit of more marginal cereal products. Repositioning also reduces the degree to which the repositioned and the incumbent cereals are differentiated from each other, a force that intensifies competition. This latter effect is likely most acute for cereal products with the maximum regulatorily-acceptable sugar level post regulation. Further, constrained cereals with original sugar content

exceeding the standard were also likely to incur additional brand equity and reformulation costs. Given these opposing forces, a clear prediction on the changes in absolute performance for either group is difficult, though one would expect that constrained products will perform relatively worse than unconstrained products.

2.3.2 Resource Transferability

We now turn to the role of resources in explaining performance differences among the products. Specifically, we explore how brand equity, a particularly important resource for consumer goods firms, moderates the impact of competition in the RTE cereal market by increasing product differentiation.

Brand equity is created over time through a firm's marketing investments and through the creation of a base of loyal consumers (Aaker, 2009) and it allows the firm to make future sales even absent further investments (Mizik & Jacobson, 2008; Vomberg, Homburg & Bornemann, 2015). The "added utility" of brands (Farquhar, 1989) creates value above that of the direct product features, suggesting products with greater brand equity will do better with increased competition than products with less brand equity by creating more perceived differentiation in the minds of the consumer which, in turn, effectively reduces competition in a market.

The values of many resources, such as brand equity, are tied to the characteristics of the focal products or the characteristics of the focal firms (Montgomery & Wernerfelt, 1988; Aaker, 1997). In the case of products, it is useful to distinguish between product-specific and firm-specific brand equity. Product-specific brand equity (e.g., Tony the Tiger image with Frosted Flakes) complements the specific attributes that define a particular product and is designed to appeal to its target customers (e.g., children wanting great taste), while firm-specific brand

equity might build a general appeal about all of the products offered by a firm (e.g., the quality of Kellogg's products).

Why might a firm prefer to invest in product-specific versus firm-specific brand equity? Product-specific brand equity would seem particularly valuable when products are more horizontally differentiated than vertically differentiated. In the vertical differentiation case, the resource sometimes derives its value from common resources that can be shared across all products, commonly based on supply side investments which are relatively invisible to buyers (Wu, 2013). Such settings lend themselves to firm-specific brand equity investments. In contrast, when resources address specific buyer preferences, resources commonly are built on observable product characteristics and can be thought of being built on the demand side. We conjecture that the relative value of a product-specific versus a firm-specific resource increases when a focal firm's products cannibalize one another because product-specific brand equity increases perceived differentiation among the focal firm's own products whereas firm-specific brand equity does not. Investments in firm-specific brand equity might even lead buyers to perceive a given firm's products as being more similar. As applied to children's cereal where many sub-segments are populated by products from the same firm, this logic predicts that the value of product-specific brand equity is greater than the value of firm-specific brand equity. We expect firms in these markets to invest more heavily in product-specific equity than firm-specific equity.

The connection between product-specific brand equity and product characteristics has potentially important implications for product repositioning. The more a product's characteristics change—the more the product moves away from its original positioning—the more the value of the product-specific resource declines (Danneels, 2011). In the case of RTE children's cereal, a key determinant of a product's position is its sugar content. Hence, a change in sugar content

potentially undermines the product-specific brand equity built at the original position. Furthermore, the value of a product's specific brand equity should decline more, the further the product is moved in product space (e.g., the more its sugar content changes). If the decline is rapid, then deterioration in product-specific brand equity would be a major consideration in repositioning. In addition, the rate of measured deterioration would be affected by whether repositioning is voluntary or involuntary where, for example, voluntary repositioning might be more benign as it might reflect changes in preferences of the primary target segment.

2.3.3 Strategic Responses to an Increase in Competition

The impacts of competition and the transferability of resources are critical factors affecting the strategic responses of firms to environmental shocks such as entry, exit, repositioning, and additional investment in resources. We consider these strategic responses next.

If product performance deteriorates because of increased competition, some exit or repositioning is likely and entry would be increasingly deterred (Seamans, 2012). We expect exit is most likely for products whose original performance was lower and whose repositioning costs are higher. In the case of children's cereals, there are technical costs of product reformulation and loss of product-specific brand equity associated with changes in product position. For marginal products, these costs could cause exit. This logic suggests, ceteris paribus, that constrained cereals are more likely to exit than unconstrained cereals.

In markets where a firm itself has competing products that compete with one another, cannibalization becomes relevant (Judd, 1985; Moorthy, 1992). In response to an external shock, such intra-firm competition may show up as a rebalancing of a firm's product portfolio via selective exit or repositioning. In the children's cereal segment, for example, one expects exit of high sugar variants (e.g., Kellogg's Froot Loops Starberry) of lower sugar cereals (e.g.,

Kellogg's Froot Loops) whose primary differentiating characteristic from their "parent" is sweetness. Such variants, if forced to drop sugar, would cannibalize the parent and, if held at higher sugar levels, would need to rely on spillovers from the parent's advertising. Based on this argument, one also expects post-regulation exit or repositioning to be positively related to increases in within firm product competition. For stronger products, these factors weigh in favor of maintaining position (Wang & Shaver 2014) or repositioning rather than exiting. For example, when resources that are closely tied to the product have substantial value, repositioning may be more attractive than exiting because repositioning allows some of the value of the resources to be continuously exploited (Sutton, 1991).

Because product-specific brand equity can be thought of as a partial antidote to competition, another response to increased numbers of competitors is to increase advertising, build brand equity, and increase product differentiation (Boulding, Lee & Staelin, 1994; Nils-Henrik M. & Stevik, 1998). That is, firms combat increased crowding by expanding the product space in a consumer's mind. This strategy appears more effective in cases where consumers are influenced both by product characteristics and image, for example, in children's cereal markets where consumers might love sugar but also attribute "superpowers" to eating particular cereals. To be sure, advertising competition is still competition, but it has the positive feature that it builds brand equity which increases differentiation and moderates competition. Hence, we expect an increase in the number of competitors in a given consumer market to increase per product advertising expenditures.

2.4 Data

We utilize three main sources of data: advertisement information from Nielsen, nutrition information from Mintel, and sales information from IRI.[13] Nielsen provides monthly national television advertisement data from 2004 at the product level, including advertisement units, expenditures, impressions generated for each age group, and characteristics such as program type and program name (Nielsen, 2015). Mintel provides cereal nutrition information as reported on the box label (e.g., sugar content, calories) over the period 2001 to 2012 (Mintel, 2015). Changes in this information (or in product availability) are identified by "shoppers" hired by Mintel who then send these changed products to Mintel. Since Mintel only makes a report when there are changes to a product or when a new product is introduced, we assume that the cereal characteristics are unchanged absent a new Mintel entry. Mintel information is consistent with nutrition data provided by the manufacturers to the U.S. Department of Agriculture.

IRI Infoscan provides sales, price, and rebate information obtained from checkout scans at a representative sample of individual stores across 50 U.S. cities from 2001 to 2012 (Bronnenberg, Kruger & Mela, 2008). We aggregate this data by product, market, and year. Cereals are offered in many different packages but about 94 percent of all sales are packaged in a box and most of those sales are in 15 oz boxes. We limit our sample to box cereals and standardize the weight per box which averaged just over 15 oz.

2.4.1 Defining Children's Cereal

Since the regulation at issue is directed towards children, our first step is to define what constitutes a children's cereal. We adopt the CFBAI definition: a cereal whose advertising is directed to an audience in which "35 percent or more…is composed of children under 12." To

[13] All estimates and analysis in this paper based on Information Resources Inc. data are by the author and not by Information Resources Inc. Weekly data for UPC-coded products are drawn from a sample which represents the universe of supermarkets with annual sales of more than $2 million dollars in the U.S. Our analysis shows that this data covers roughly 5 percent of all grocery stores in the U.S.

identify children's cereals, we first aggregate by product-year total impressions generated in each age category. Next, for each product-year, we calculate the percent of impressions generated on children (ages 2–11) relative to impressions on all audiences. We identify 73 products that had at least 35 percent of the total impressions generated in the (2–11) age category for at least one year between 2004 and 2012 and categorize them as children's cereals.[14] For example, General Mills Cinnamon Toast Crunch is categorized as a children's cereal because it generated more than 36 percent of all their ad impressions in the (2–11) age range from 2004 to 2008 even though that percentage dropped after 2009. We removed Kellogg's Rice Krispies from the sample because it was a very low sugar cereal (4g) which was repositioned away from the children's segment well before CFBAI was implemented.[15] For the 73 identified children's products, firms generated between 85 to 100 percent (mean of 97) of all children's impressions from programs directed toward children. That is, for our defined children's products, the manufacturers gain impressions from programs primarily watched by children (e.g., cartoons and not news) and there is a

[14] Although the initial definitions of child-directed advertising and children's cereal across the participant firms differed somewhat, the differences are not material to our analysis. The 35 percent definition was the original General Mills definition and became the generally used definition (Lee, Kolish & Enright, 2010). The PepsiCo (Quaker Oats) definition was most different, but each product they classified as children's cereals was well above our 35% cut-off and products not considered children's cereals by either the PepsiCo definition or our definition, were at 10% or lower. Changing the definition around 35 percent does not make a substantial difference.
[15] We test our findings both with and without Rice Krispies inclusion, finding no major differences.

relatively strong distinction between adult and children's segments.

Table 2.1: Summary statistics on children's cereals.

Statistic	Mean	St. Dev.	Min	Max
Sales (million units)	1.59	1.40	0.02	7.16
Revenue (million dollars)	4.49	3.53	0.05	15.04
Product equity (million dollars)	6.34	6.92	0	42.10
Firm equity (million dollars)	37.27	23.82	0	90.44
Unit price (dollar)	2.78	0.24	2.24	3.33
Ounce price (dollar)	0.20	0.03	0.14	0.28
In store display (thousand)	10.21	7.13	0	37
Discount (thousand)	0.51	0.73	0	3

Summary statistics are for children's products. Sales is the number of cereal boxes sold standardized at 15.16 oz per box. Revenue is in millions of dollars. Product and firm equity are the average two year rolling total advertising spending at the product and firm levels in millions, unit and ounce prices are in dollars. In store display is the number of in store advertisement displays, discount is the number of coupons or rebates used. Mean represents simple averages and are not weighted by sales. Advertising data from Nielsen and captures ads nationally. Sales data aggregated from IRI sample stores. Data aggregated at product-year-national level from 2004 - 2012.

We begin with the IRI database which contains sales and prices for local city markets. About 40 percent of the children's products are missing from this database, but they are of relatively limited consequence because the products combine for less than 6 percent of the total advertising spending on children's cereals, usually appear for one to two years, and are mostly variants of a primary product brand. Next, we merge Nielsen advertising information and Mintel nutrition information into the IRI data. The merged data cover 50 city markets and span 2004 to 2012. Summary statistics are provided in Table 2.1.

The heterogeneity of product-level positions and resources suggests that the impact of the CFBAI regulation will vary across products and firms. To give a sense of the differences in vulnerability to the regulation, consider Figure 2.1 which plots advertising versus sugar content of major children's cereal products in 2005 prior to the formation of CFBAI. The northeast quadrant (high sugar, high advertising) is occupied by both Kellogg's and General Mills. However, Kellogg's products tend to have higher sugar compared to that of General Mills. In the northwest quadrant (low sugar, high advertising), we find the best-selling General Mills

Cinnamon Toast Crunch and Kellogg's Frosted Flakes. Cinnamon Toast Crunch occupies a relatively more regulation favorable resource position with a lower sugar content. Post and Quaker Oats are better positioned than General Mills and Kellogg's in terms of direct regulatory vulnerability. Figure 2.2 shows a similar plot for 2009, after regulation.

Figure 2.1 suggests that the regulation hit Kellogg's the hardest as it required the biggest changes to comply. The figure does not provide a clear basis for assessing which firm's products will encounter the largest increase in competition as a result of regulation. Nonetheless, based on compression of products along the sugar dimension, a comparison of the two figures provides evidence of increased crowding.

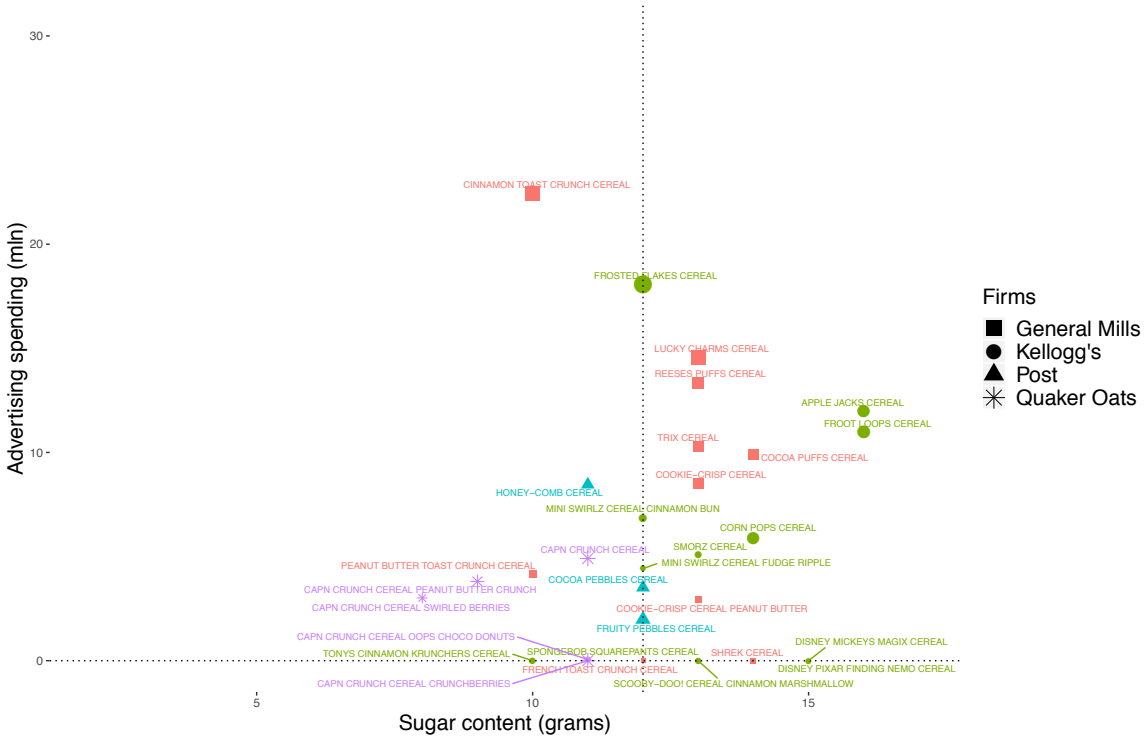


Figure 2.1. Product positioning of children's cereal (2005)

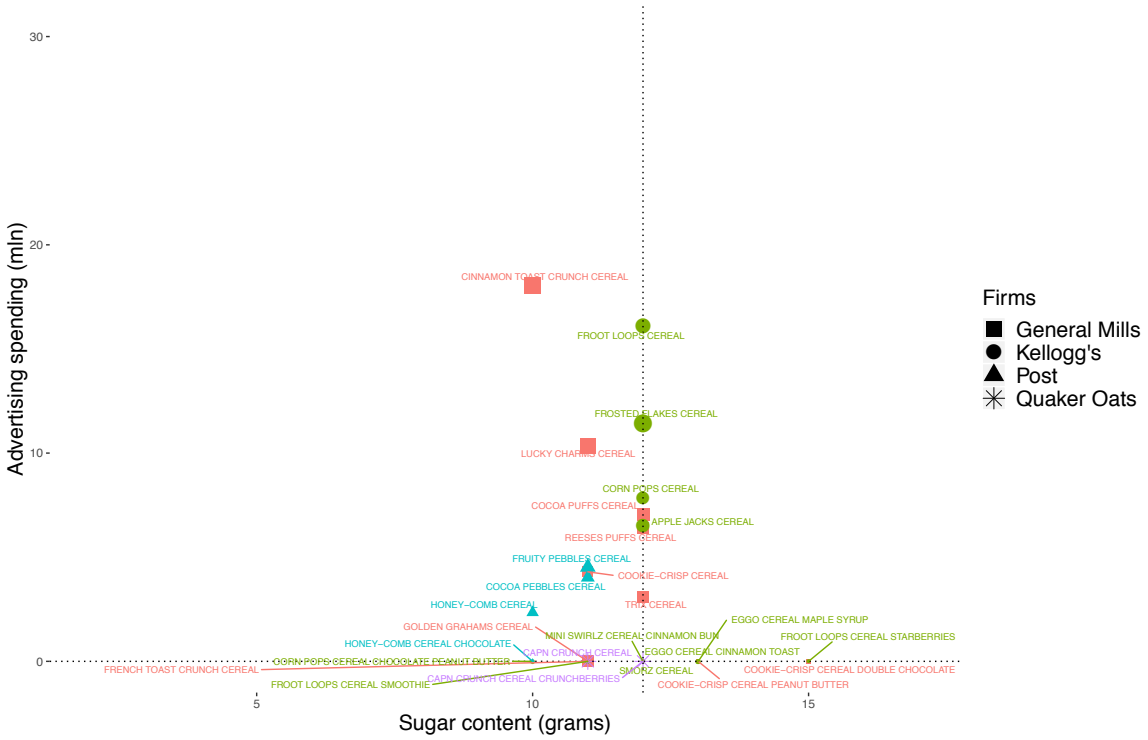


Figure 2.2. Product positioning of children's cereal (2009)

2.5 Empirical Models and Results

In this section we use data on the children's RTE cereals to investigate the ideas developed in Section 3. We follow the organization of Section 3 by first examining the impact of intensified competition on the performance of constrained and unconstrained products. We then assess the relative value of product-specific and firm-specific brand equity and the changes in the value of product-specific brand equity caused by repositioning. Finally, we discuss how firms strategically responded to the induced repositioning of the constrained cereals.

2.5.1 Impact on Product Performance (Constrained vs. Unconstrained)

Ideally, we would measure the profit change directly, but because cost information is unavailable to us, we focus on changes in sales. A relative decrease in sales of constrained products translates to a relative decrease in profitability if the relative change in costs of

producing and marketing the constrained cereals weakly increases while prices of constrained products do not increase relative to the prices of unconstrained products. The cost condition seems likely given the added costs of repositioning incurred by the constrained products, while the relative price condition is consistent with the empirical evidence. Hence, in this setting, changes in sales provide good proxies for changes in performance.

The impact of product crowding can be seen in Figure 2.3 which plots over time the aggregate sales volume across our 50-city sample for the categories of unconstrained and constrained products. The y-axis and x-axis measure the number of cereal boxes sold and time from self-regulation implementation (e.g., where 0 indicates the first year of implementation), respectively. Sales of each group followed roughly parallel tracks before diverging after the implementation of CFBAI.

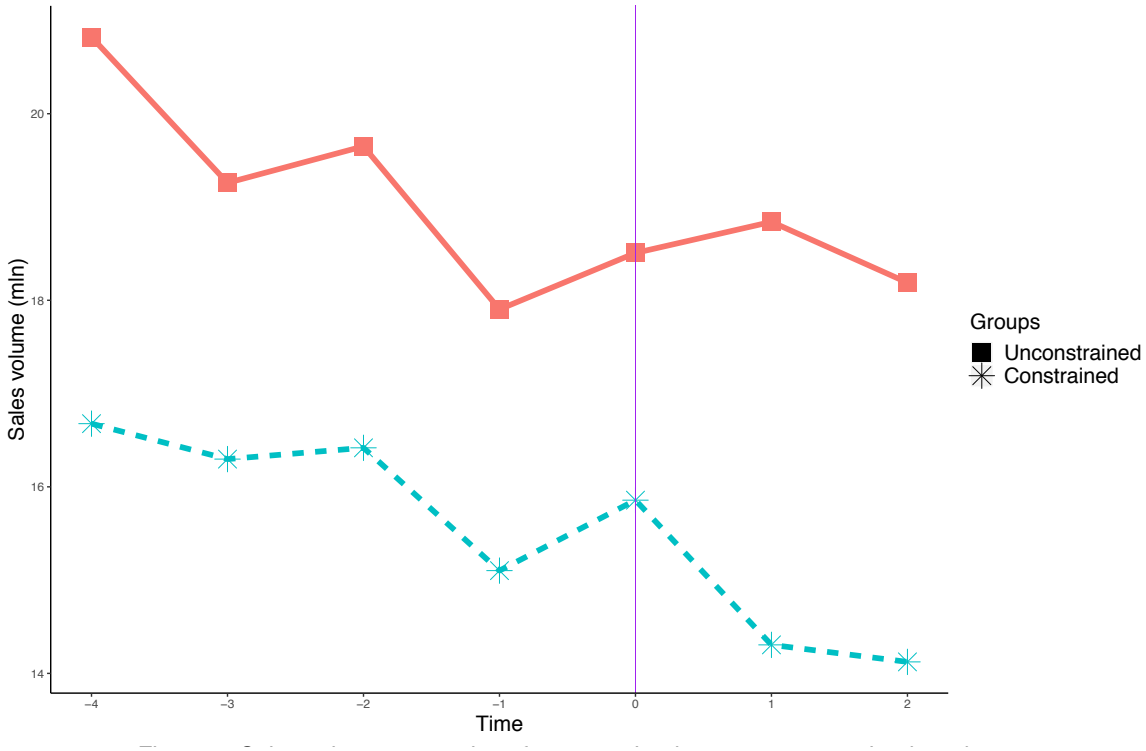


Figure 2.3. Sales volume comparison for constrained versus unconstrained products

To examine market outcomes more rigorously, we use an approach similar in spirit to a difference-in-differences approach to compare the sales impact of regulation on constrained versus unconstrained products.[16] Repositioned cereals that subsequently meet the sugar standard are not reclassified. The implementation date is defined as the regulation implementation year which differs slightly across firms.[17]

The empirical specification is of the following form:

$$Y_{ijt} = \beta_0 + \beta_1 \times constrained_i + \beta_2 \times post_{it} + \beta_3 \times constrained_i \times post_{it} + X_{ijt}B + \phi_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (1)$$

Where Y_{ijt} is the standardized sales volume for product *i* in market *j* at time *t*. Variable $constrained_i$ is a dummy variable that takes on the value of one if the product is constrained and zero otherwise. $Post_{it}$ is a dummy variable that takes on the value of one after the relevant firm's regulation implementation date. Variable X_{ijt} is a vector of control variables (e.g., product equity, price). We create variable $product\ equity_{it}$ as the average annual advertising spending over the last two years. This variable proxies for product-specific brand equity which is built in this industry through advertising spending (Aaker & Biel, 1993).[18] In addition, we create variable $firm\ equity_{it}$ to capture firm-specific brand equity by aggregating annual advertising spending (again from a two-year average) for all children's brands of firm *k* at time *t* minus $product\ equity_{it}$. We discuss this choice below. Variable ϕ_i is a product fixed effect,[19] γ_j is a

[16] We use children's cereal products that are unconstrained as a comparison to measure the impact of regulation. Because consumers substituted between constrained and unconstrained products, the impact we measure should be thought of as the joint effect of self-regulation on both constrained and unconstrained cereal products as opposed to the effect on the constrained group only as would result from an ideal difference-in-differences approach. Our approach has the advantage of avoiding potential concerns where a control group constructed through methods such as matching may be dissimilar on important but unobservable dimensions from the treatment group.

[17] Since our data is aggregated by year, we identify constrained years as those years for each firm at which most of the sales were first affected by the regulation: GM 2008, KL 2009, PepsiCo 2008, Post 2010 (Kolish, 2008).

[18] Variables $product\ equity_{it}$ and $firm\ equity_{it}$ extrapolate 2003 advertising spending using 2004 advertising spending adjusted by a factor based on the total advertising spending reported in the 10K.

[19] We also ran our specification with firm fixed effects. Results do not differ for our coefficient of interest.

fixed effect for city market j, and η_t is a year fixed effect. Inclusion of product and market fixed effects control for fixed differences across products and markets, while the year fixed effect controls for common macroeconomic shocks.[20] Standard errors are clustered at the market level.

Table 2.2 summarizes our empirical results regarding product-level sales performance. Models (1) to (3) address relative sales changes with the variable $constrained_i \times post_{it}$. In all models, sales of constrained products decreased post-regulation more than sales of unconstrained products. For Model 3, with the most exhaustive set of controls, constrained products suffered a post-regulation decrease in sales of just over 4000 units per product-market-year compared to unconstrained products. With mean sales per product-market-year for constrained products prior to regulation at about 25,000 units, the relative decrease is about 16 percent of sales. An analysis of relative prices finds that on average price decreased for constrained products relative to unconstrained products by $0.128 per box, a four percent reduction. Hence, making the reasonable assumption that relative costs have weakly increased for constrained versus unconstrained products, the relative price and sales declines imply that profitability has also relatively decreased for constrained versus unconstrained products.

[20] Given potential endogeneity concerns regarding the price variable, we use price for other geographical markets as instruments.

Table 2.2: Effect of regulation on sales for constrained and unconstrained products.

	(1)	(2)	(3)	(4)
Constrained × post	−1.501	−1.875	−4.079	
	(0.817)	(0.873)	(1.637)	
Standard × post				−5.674
				(3.356)
Post	2.317	2.454	4.029	9.129
	(0.736)	(0.767)	(1.224)	(1.459)
Product equity	0.174	0.180	0.168	0.703
	(0.101)	(0.104)	(0.100)	(0.135)
Firm equity	0.039	0.056	0.052	0.062
	(0.026)	(0.033)	(0.032)	(0.028)
In store display	0.106	0.105	0.106	0.166
	(0.013)	(0.013)	(0.013)	(0.015)
Price	0.038	0.021	−0.267	−2.773
	(0.256)	(0.256)	(0.184)	(0.345)
Discount		0.046	0.041	0.024
		(0.014)	(0.014)	(0.014)
Sugar			−0.317	
			(0.311)	
Constant	28.597	27.644	35.010	39.980
	(10.901)	(11.197)	(8.567)	(6.148)
Observations	9,850	9,850	9,250	4,200
R^2	0.789	0.791	0.794	0.817

Dependent variable is in number of cereal boxes sold in thousands standardized at 15.16 oz per box. Constrained indicates products that contained more than 12 grams of sugar per serving prior to regulation. Model (4) is subset to only unconstrained products, standard is a dummy variable that further subsets the unconstrained products, where 1 indicates unconstrained products that contained 12 grams of sugar per serving the year prior to regulation and 0 indicates unconstrained products that contained less than 12 grams of sugar. Product and firm equity are the average two year rolling total advertising spending at the product and firm levels in millions (firm equity represents total advertising spending at the firm level on all products by the respective firm less the spending for the focal product), in store display is the number of in store advertisement displays, price is in cents per oz, discount is the number of coupons or rebates used. Nutrition content are per serving, sugar in grams. Models (1) - (3) include product, year and market fixed effects. Model (4) include year and market fixed effects. Standard error clustered at the market level.

These results support the prediction from Section 3 that constrained products perform relatively worse than unconstrained products. What about absolute performance? In Model 4, we focus attention on the set of *unconstrained* products with the highest allowed level of sugar because competition at that level of sugar should be the most intense and costs are likely constant both before and after regulation. We identify performance by replacing $constrained_i \times post_{it}$ in (1) with $standard_i \times post_{it}$, where $standard_i$ takes on the value of one for products with

12g of sugar and zero, otherwise. Mean sales decreased roughly 5,700 units more post regulation for products at the standard versus products with sugar levels less than the standard. Based on a mean sales of about 66 thousand units for unconstrained products at the standard prior to the regulation, this decrease represents 10 percent of sales.[21] This result suggests that for 12g incumbent products crowding led to sales losses relative to the even lower sugar incumbents, perhaps because losses to the newly repositioned products were not sufficiently offset by increased overall demand.

Finally, to empirically assess CFBAI's effects on short-run performance of firm *k*, we modify equation (1) to replace product interactions with firm interactions ($firm_k$ with $post_{it}$):

$$Y_{ijt} = \beta_0 + \beta_1 \times firm_k + \beta_2 \times post_{it} + \beta_3 \times firm_k \times post_{it} + X_{ijt}B + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (2)$$

Table 2.3 displays the results for this analysis with General Mills as the reference firm. All three models estimate Kellogg's change in sales after regulation to be worse than that of General Mills, while Post and Quaker Oat's post-regulation change is better. Given that Kellogg's had more, and Post and Quaker Oats had fewer, constrained products than General Mills.

[21] An additional analysis was undertaken to assess whether constrained and unconstrained cereals exhibited different trends prior to regulation being implemented. No evidence of different time trends was found.

Table 2.3: Effect of regulation on sales at the firm level.

	(1)	(2)	(3)
Kellogg's × post	−2.311	−2.675	−2.990
	(0.266)	(0.273)	(0.137)
Post Cereals × post	12.052	12.420	14.129
	(1.263)	(1.033)	(2.695)
Quaker × post	0.484	1.165	9.959
	(0.283)	(0.404)	(3.151)
Post	−0.214	−0.525	−1.653
	(0.929)	(0.679)	(1.453)
Product equity	1.587	1.584	1.560
	(0.071)	(0.072)	(0.049)
In store display	0.112	0.109	0.113
	(0.006)	(0.005)	(0.005)
Price	−2.016	−1.991	−1.833
	(0.335)	(0.338)	(0.455)
Discount		0.054	0.049
		(0.016)	(0.016)
Sugar			−1.931
			(1.045)
Constant	30.032	29.840	49.673
	(8.303)	(8.304)	(20.660)
Observations	9,850	9,850	9,250
R^2	0.737	0.739	0.744

Dependent variable is in number of cereal boxes sold in thousands standardized at 15.16 oz per box. Product equity is the average two year rolling advertising spending at the product level in millions, in store display is the number of in store displays, price is in cents per oz, discount is the number of coupons or rebates used. Nutrition content are per serving, sugar in grams. All models include company, year and market fixed effects. Standard error clustered at the market level. Reference company is General Mills.

2.5.2 Impact on Product Performance (Resource Transferability)

In Section 3.2 we argued that (1) product-specific brand equity may be more valuable than firm-specific brand equity in differentiated product settings with substantial cannibalization and (2) repositioning leads to declines in the value of product-specific brand equity. To explore these possibilities we shift our focus from measuring general regulatory impact using a difference-in-differences like approach to examining changes in the value of brand equity using a granular estimation based around repositioning of individual products over the entire study

period. We construct the variable $product\ travel\ distance_{it}$ and interact it with $product\ equity_{it}$. $Product\ travel\ distance_{it}$ is proxied using the year-to-year change in sugar distance, so this interaction helps us examine the value of product-specific brand equity as a product is repositioned in terms of its sugar level.

$$Y_{ijt} = \beta_0 + \beta_1 \times product\ equity_{it} + \beta_2 \times product\ travel\ distance_{it} + \beta_3 \times product\ equity_{it} \times product\ travel\ distance_{it} + \beta_4 \times firm\ equity_{it} + X_{ijt}B + \phi_i + \gamma_j + \eta_t + \varepsilon_{ijt} \quad (3)$$

Table 2.4: Effect of product equity on sales.

	(1)	(2)	(3)
Product equity × product travel distance	−0.121	−0.116	−0.119
	(0.059)	(0.057)	(0.058)
Product equity	0.206	0.207	0.214
	(0.093)	(0.093)	(0.096)
Product travel distance	0.682	0.624	0.557
	(0.489)	(0.469)	(0.458)
Firm equity	0.030	0.031	0.046
	(0.028)	(0.028)	(0.034)
In store display	0.108	0.107	0.105
	(0.013)	(0.013)	(0.013)
Price		−0.377	−0.405
		(0.236)	(0.241)
Discount			0.042
			(0.014)
Constant	28.928	35.707	35.203
	(6.998)	(9.525)	(9.609)
Observations	9,250	9,250	9,250
R^2	0.792	0.793	0.794

Dependent variable is in number of cereal boxes sold in thousands standardized at 15.16 oz per box. Product and firm equity are the average two year rolling total advertising spending at the product and firm levels in millions (firm equity represents total advertising spending at the firm level on all products by the respective firm less the spending for the focal product), product travel distance is the change in sugar content from year to year. In store display is the number of in store advertisement displays, price is in cents per oz, discount is the number of coupons or rebates used, sugar in grams. All models include product, year, and market fixed effects. Standard error clustered at the market level.

Before interpreting the regression results, it is helpful to further explain our choice for the measure of firm-specific brand equity. Directly separating advertising that is product specific from advertising that is firm specific is impossible given our data and the context. But if brand advertising for other brands does not create product-specific brand equity for the focal product,

e.g. advertising for Fruit Loops only helps sales of Frosted Flakes via building Kellogg's firm brand equity, then same-firm spending on non-focal products can proxy for firm-specific brand equity spending on non-focal products.

With this construction in mind, the regression results in Table 2.4 provide weak supporting evidence that product-specific brand equity is more valuable than firm-specific brand equity as the coefficient on $firm\ equity_{it}$ is insignificant throughout all four specifications. This outcome, of course, could be the result of the weak power of the test. Furthermore, the construction of the brand-specific brand equity measure makes a relative comparison of coefficient estimates for product and firm-specific brand equities of limited interest because the firm-specific measure includes product-specific brand equity spending for non-focal products.

We now turn to the product-specific brand equity costs of repositioning. Using the constrained product sample and controlling for various observables, the coefficient on $product\ equity_{it}$ in Model 3 in Table 2.4 suggests a one million dollar increase in $product\ equity_{it}$ increases sales by about 214 units when the product does not move its position. At the sample average $product\ equity_{it}$ of about \$6 million dollars and the sample average sales of 1.6 million units nationally, the value of product brand equity is about 7 percent of sales.[22] Given product fixed effects and the variable's construction, this is a narrow and very conservative measure of product-specific brand equity which is probably best interpreted as the value of adding a million dollars to product-specific brand equity. When $product\ travel\ distance_{it}$ changes by 1 unit (between 7-10% in sugar level) from its previous position, the incremental value of a one million dollar increase in $product\ equity_{it}$ decreases by 119 units, which is substantial when compared to the average value of increasing investment in

[22] This is compared to the average sales within group controlling for product, market, and year fixed effects.

brand equity. For high and medium brand-equity products this decrease was roughly 3.5% of sales. The repositioning-cost results support the theory that predicts the value of product-specific brand equity is tightly linked to the product's previous position and that the further the product is moved in product space, the more the value of a product's specific brand equity declines. The 3.5% sales loss may underestimate the cost of an isolated move because the estimation includes many cases where more than one product is repositioned simultaneously. In those cases, any given repositioned product will capture a portion of the brand-equity related sales losses of the other repositioned products. On the other hand, the measured sales decline might also capture the impact of increased competition because most of the observed repositioning involved reductions of sugar. To check this possibility we controlled for the number of competitors at a given sugar level and found the Table 2.4 results robust to this addition. This check supports the view that the primary source of performance decline was the reduction in brand equity caused by repositioning.

2.5.3 *Firm Strategic Responses to Regulation*

Compliance with the sugar standard through induced product repositioning crowded the product space and increased competition by forcing products to become more similar on the key taste dimension of sweetness. This crowding can lead to exit or repositioning away from a predominately children targeting.[23] In this subsection we explore these strategic responses.

The average number of (advertised) product and product variants offered in a given year in the children's segment of the RTE cereal industry decreased from 26 before regulation to 19 after regulation. Six of the exiting products were variants of a main brand or were variants associated with cartoon characters. Only one was a main brand product (Kellogg's Mini Swirlz).

[23] We observed no meaningful entry in our study period until 2012 when Kellogg's introduced Krave Cereal.

If the cost associated with greater repositioning (distance) is greater, then we expect it more likely that higher sugar cereals will exit. Using a Cox proportional hazards model, we estimate the likelihood of exit based on how much a constrained product exceeded the 12g sugar standard prior to regulation:

$$h(t) = h_0(t)\exp(\beta_0 + \beta_1 \times sugar\ distance_{it} + X_{it}B + \pi_k + \varepsilon_{it}) \quad (4)$$

where $h(t)$ is the hazard function for product i at time t given covariate vector X_{it}, $sugar\ distance_{it}$ is the number of grams of sugar above the 12 grams level, X_{it} is a vector of control variables, and π_k is a firm fixed effect. We define survival length as the number of years survived after regulation. Model 3 in Table 2.5 shows that the estimated coefficient for $sugar\ distance$ is 0.426 and is statistically different from zero, which posits the hazard rate of discontinuation for constrained products increases with the increase in sugar content. As discussed in Section 3.3, there are many possible factors leading to exit which may be captured by our sugar distance measure.

Table 2.5: Cox proportional hazards model for children's cereal.

	(1)	(2)	(3)
Sugar distance	0.097	0.379	0.426
	(0.146)	(0.217)	(0.215)
Price	−6.069	−23.828	−25.536
	(12.055)	(16.270)	(16.571)
In store display	−0.076	−0.102	−0.109
	(0.026)	(0.030)	(0.033)
Product equity		0.449	0.443
		(0.263)	(0.278)
Observations	37	37	37
R^2	0.624	0.655	0.671

The hazard is the probability that if a product survives to year t, it will experience exit in the next year. Survival event is defined as product exit between 2004 and 2012. Survival length is measured as the number of years the product variant survived after the implementation date until 2012. Sugar distance is the sugar content of the product in its last year prior to regulation implementation less the regulation constraint level of 12 grams per serving. Product equity is based on cumulative advertising spending. Model (3) includes additional company fixed effects.

We next examine whether an increase in competition caused by crowding increases product repositioning to appeal to a broader or different segment of customers. To do this we need a measure of repositioning and then a measure of competition. Regarding repositioning, we focus on changes in consumer segment targeting. Figure 2.4 plots the distribution of television ads for children's cereals before and after regulation that are categorized by each advertisement's ratio of advertising "impressions" generated on adults to impressions on children, broken down by constrained and unconstrained products. The plots do not suggest a major differences on this dimension between the two product groups.[24] The plots also indicate that most children's cereals advertise heavily in children-only programming.

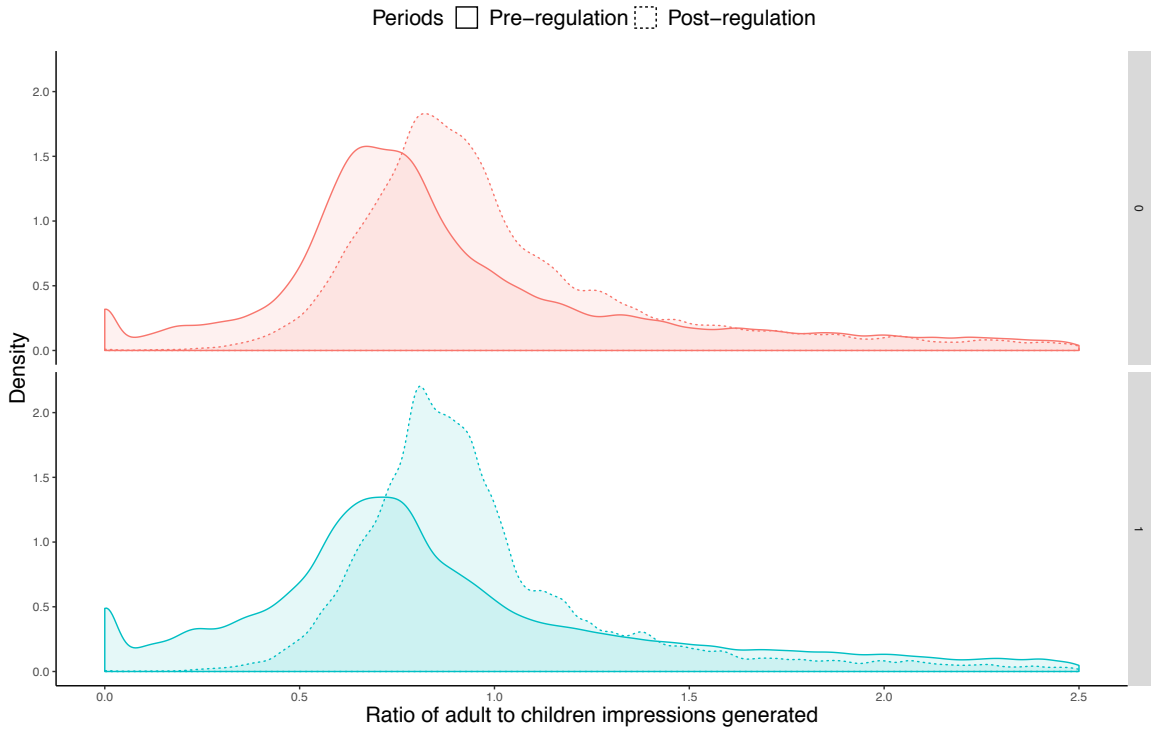


Figure 2.4. Distribution of television ads by audience ratio.

[24] Of the three products that were repositioned the most based on our measure, two (General Mills Cinnamon Toast Crunch and Kellogg's Frosted Flakes) were unconstrained, while one (Kellogg's Froot Loops) was constrained.

These plots suggest a good measure of repositioning is the change in the ratio of adult program advertising spending to children's program spending, $\frac{adult_{it}}{children_{it}}$. As suggested by Figure 2.4, for most of the advertised products in the children's segment of the market that ratio is relatively small. For example, Lucky Charms in 2006 had a ratio of 0.01 while Apple Jack's had a ratio of 0.18. We interpret an increase in the ratio as repositioning towards a different market subsegment, e.g. focusing more on teens than children.

Next, to construct a measure of competition, we characterize cereals through three principal ingredients, then for each cereal we determine how many other cereals have relatively similar ingredients. Competition is greater for product i when there are more cereal competitors which have similar ingredients. Specifically, first, for each product, we reduced its characteristics into a single dimension using the propensity score method to create a product score.[25] Then, for each pair of products i and j, we calculate their similarity ($similarity\ distance_{i,j}$) using the difference in their scores. The distance is scaled from zero to one, with one indicating the largest distance between two products. Second, we develop a proxy for the overall level of competition ($number\ all\ competitors$) faced by each product by counting the number of products within a given $similarity\ distance$ of the focal product.[26] This count is further divided into the number of own-firm competitors ($number\ own\ competitors$) and the number of rival competitors

[25] We decompose all products spanning the entire time frame (e.g., $product_i$) into three product characteristics (e.g., $sugar_{it}, sodium_{it}, protein_{it}$). To measure how close each of the other products (e.g., $product_j$) is from $product_i$, we create a dummy variable that equals 1 for $product_i$ and 0 otherwise. Using the three decomposed product characteristics for each year, we calculate for each product an estimated probability (e.g., propensity score) that its three characteristics predicts the product to be $product_i$, denoting this estimate as $score_i$ for $product_i$, $score_j$ for $product_j$ etc.

[26] We choose a cutoff distance of 0.2 for our analysis because it produces a reasonable variability in levels of competition, though our results are not particularly sensitive to the cutoff choice. The smaller the cutoff the more similar the included competitors are to the focal firm. 0.2 was the smallest cutoff that still produced significant variability in the number of competitors. Varying the level from 0.2 to 0.5 did not significantly change the results.

($number\ other\ competitors$).[27]

Our empirical examination of the relationship between product competition and product repositioning uses the following specification:

$$reposition_{it} = \beta_0 + \beta_1 \times competition_{it} + X_{it}B + \phi_i + \varepsilon_{it} \quad (5)$$

where $reposition_{it}$ and $competition_{it}$ measure the repositioning efforts and the competition level of product i at time t respectively. Using our similarity measure, the overall level of competition increased by 14 percent after regulation.

The product fixed-effect regression results reported in Table 2.6 suggest that products that face increased competition are more likely to be repositioned. In Model 1 the coefficient on $number\ all\ competitors$ indicates that when the number of close competitors increases by one, the ratio of $\frac{adult_{it}}{children_{it}}$ advertising spending increases by 0.014, representing 20 percent of the mean $\frac{adult_{it}}{children_{it}}$ ratio in our data. This measure captures a few major repositioning moves such as with Frosted Flakes which changed from advertising predominately to children in 2004 to advertising strongly to adults by 2010. In Model 4 we attempt to distinguish the impacts of own and rival competition, but the results are not significant, likely due to the relatively small number of observations.[28] Models 2 and 3 focus just on own or just on rival competition, respectively. These regressions are not ideally specified, but provide weak evidence that cannibalization may

[27] As an example, consider Reese's Puffs cereal which contained 13g of sugar, 195mg of sodium, and 1.9g of protein per serving and, based on our measures, it had no close competitors in 2007. Reese's Puff was reformulated in 2008 to contain 12g of sugar, 180mg of sodium, and 2g of protein per serving. It subsequently faced three competitors: Post Honeycomb (sugar 10g, sodium 170mg, protein 2g), General Mills Trix (sugar 13g, sodium 180mg, protein 2g), and General Mills Lucky Charms (sugar 11g, sodium 190mg, protein 2g).

[28] However, likelihood ratio testing between Model 4 and a model which removes the two competition variables indicates that the combined effect of the two variables is different from zero. $F = \frac{(SSE_0 - SSE_1)/(p1-p0)}{SSE_1/(n-p1)} = \frac{(10.337-9.803)/(18-16)}{9.803/(116-18)} = 2.67$, under H_0 follows $F_{2,98}$, p-value 0.0763.

be more important than rival competition.[29] The disparity may reflect business stealing benefits that exist against rival products but not against a firm's own products (Banbury & Mitchell, 1995).

Table 2.6: Effect of product competition on repositioning.

	(1)	(2)	(3)	(4)
Number all competitors	0.014			
	(0.006)			
Number own competitors		0.045		0.021
		(0.022)		(0.032)
Number other competitors			0.018	0.012
			(0.008)	(0.012)
Product equity	0.049	0.049	0.048	0.049
	(0.015)	(0.015)	(0.015)	(0.015)
Constant	−0.654	−0.677	−0.619	−0.666
	(0.323)	(0.330)	(0.321)	(0.330)
Observations	116	116	116	116
R^2	0.406	0.400	0.404	0.406

Dependent variable is the ratio of advertising spending on adult programs over children's programs. Number all competitors, number own competitors, and number other competitors measure the number of cereal products within a propensity score of 0.2 from $product_i$ that is a children's cereal, a children's cereal from the same firm as $product_i$, and a children's cereal from a different firm than $product_i$. Correlation coefficient between number own competitors and number other competitors is 0.68. Product equity is based on cumulative advertising spending. Data ranges from 2004 to 2012 aggregated at the product-year level.

We also considered an alternative interpretation that firms may reposition their advertising toward adults as a means to indirectly target children. But an analysis of the Nielsen Consumer Panel Data provides evidence against this interpretation: while sales of repositioned products to households with children experienced a sales decline post regulation, sales to households without children experienced a modest increase.

Section 3.3 argued that increased competition may lead firms to invest in advertising to build a product's brand equity. To examine this possibility, we replace the repositioning

[29] Because of large standard errors in Model 4, we cannot statistically distinguish the other competition and cannibalization effects from zero. But in Models 2 and 3 (where the variables are entered separately, we see that the cannibalization effect is larger than the other competition effect, albeit for regressions that are not directly comparable. These results are robust to sales-weighted competition over products that spanned our time frame as well as competition counts that included products that appeared for only a portion of the time frame.

dependent variable in the empirical specifications described in Table 2.6 with the year-to-year change in advertising spending for each product and remove the product-specific brand equity variable. Consistent with our theoretical predictions, we find that an increase in the number of competitors in a given consumer market increased per product advertising expenditures. Specifically, as reported in Table 2.7 (Model 1), the coefficient on *number all competitors* (0.167) suggests that when the number of close competitors to the focal product increases by one, there is a $167,000 increase in advertising spending, representing a 17 percent increase at the mean spending level. This increase may reflect the value of increased differentiation with increased competition but could also reflect current-period advertising competition. We think both factors are in play, especially as children are likely to be more responsive to non-functional product attributes than adults, but we cannot determine the relative sizes of the effects.

Table 2.7: Effect of product competition on advertising spending.

	(1)	(2)	(3)	(4)
Number all competitors	0.167			
	(0.079)			
Number own competitors		0.692		0.580
		(0.298)		(0.410)
Number other competitors			0.185	0.054
			(0.099)	(0.135)
Constant	−0.200	−0.725	−0.033	−0.613
	(1.597)	(1.617)	(1.602)	(1.647)
Observations	127	127	127	127
R^2	0.094	0.101	0.086	0.103

Dependent variable is year to year change in advertising spending in millions. Number all competitors, number own competitors, and number other competitors measure the number of cereal products within a propensity score of 0.2 from $product_i$ that is a children's cereal, a children's cereal from the same firm as $product_i$, and a children's cereal from a different firm than $product_i$. Correlation coefficient between number own competitors and number other competitors is 0.68. Data ranges from 2004 to 2012 and is at the product-year level.

2.6 Discussion and Conclusions

This paper exploits a natural experiment involving self-regulation to evaluate how firms respond to entry in light of changes in competition and to estimate the value of their product-specific resources. Regulation led to a crowding of the product space by forcing differentiated products to become more similar. In our CFBAI setting the intervention regarding reduced sugar was very narrow—yet very important—and occurred in a market with a large number of differentiated products for key market variables are observable. These features make possible a granular assessment of repositioning with own and rival competition and brand equity resources.

These features give our study some advantages over previous studies regarding either repositioning in response to entry (Wang & Shaver, 2014; Flammer, 2015), brand equity responses to increased competition (Flammer, 2015), or acquisition (Frake, 2017). We assess, for example, the magnitude of the effects using performance measures. Hence, we estimate the unequal regulatory impact across the firms, the localness of product-specific brand equity, and the amount by which firms reinvest in product-specific brand equity in response to increases in competition. We find repositioning resulted in a decrease of 3.5 percent of sales for a single gram reduction in sugar which is substantial, particularly given that many cereals needed to reduce sugar by two or more grams. Further, investment in product-specific brand equity increased by 17 percent on average per product with each additional close competitor.

Our finding that product-specific brand equity deteriorates rapidly with changes in position raises an interesting question about repositioning strategies over time. How quickly should a firm change the position of its products? While we do not explore this question, there is evidence that General Mills, where possible, favored a gradual reduction in sugar to allow the consumers to adjust to lower sweetness (Skidmore, 2009; Jargon, 2011). This transitional strategy is consistent with our sample evidence which shows that General Mills did not change

sugar content for any product by more than two grams in a single year, whereas Kellogg's reduced sugar by three grams in a single year for two of its most popular products.[30] A more gradual change in position might mitigate the repositioning penalty on product brand equity.

In Section 3.2 we argued that firms will have a greater incentive to invest in product-specific rather than firm-specific brand equity when they have multiple products competing in the same market. The reasoning was that both investments help versus rival products, but product-specific brand equity investments also reduce competition among own products. This theory connects the corporate strategy literature focused on conflicts raised by different, but related, businesses (or products) in a firm's portfolio as opposed to literature focused on shared resources (e.g., (Banbury & Mitchell, 1995; Levinthal & Wu, 2010). Our empirical analysis provided only a weak suggestion that product-specific investment was of greater value in this market than firm-specific investment. Because we lacked direct measures of firm-specific advertising investments, we relied a measure constructed from overall firm advertising (minus that of the focal product). Unfortunately, this indirect measure is not ideal for making a comparative value statement. This question remains largely open.

While our assessments are for a particular market, the children's RTE breakfast cereal market seems typical of multi-product, consumer goods markets. We complement Wang and Shaver's dominant firm entry-induced repositioning analysis with an analysis of repositioning that is induced by factors that simultaneously affect many near-equal competitors responding to, for example, regulation, technological change, or a shift in consumer preferences. Like Wang and Shaver, we do not focus on repositioning based on opportunities (Greve, 1995). In the context of children's cereals, however, we speculate that repositioning induced by competition

[30] Two of General Mills' products appeared to begin reformulation earlier than the regulation implementation date. Such early anticipation would slightly reduce the regulatory impact that we measure.

will sometimes be shaped by the opportunity to target older customers, perhaps by harvesting a product's (older) brand loyal customers while not further investing in attracting new (younger) customers. Such a transitional repositioning relates to a cross-product loyalty strategy through which companies build firm loyalty with entry level products in hopes that those same consumers (as they become older and more wealthy) will purchase the company's higher-level products (Li, Sun & Montgomery, 2011).

By focusing on a particular industry, we are better able to explore nuances associated with product-level decisions, but a single industry study has the disadvantage of limiting the amount of data. This data limitation weakens the power of our tests and limits our ability to distinguish among alternative hypothesis. We attempt to control for unobserved product and firm heterogeneity, but are unable to fully discount the potential for time-varying changes in characteristics. Thus, although we control for time fixed effects, we do not fully account for trends associated with the financial crisis or for a general consumer demand shift away from high-sugar products. With respect to the latter, a more rigorous examination of high-sugar and lower-sugar product sales trends in the four years prior to the regulation does not find such a trend, nor did we find evidence over this time period of a demand shift away from cookies, a similar children-oriented high-sugar product category.

When firms differ in terms of their resources and their market positions prior to regulation, they are likely to experience different impacts from a given regulation.[31] Such uneven effects suggest that both self-regulation and regulation may be utilized strategically.[32] Examining

[31] By showing that a firm's prospective vulnerability is not tied solely to products directly affected by the regulation, we add to the social impact of regulation literature (e.g., (Hahn & Hird, 1991; Armstrong & Sappington, 2007).
[32] Firms sometimes exploit regulatory loopholes by complying with the letter, but not necessarily the spirit of the regulation. For example, in other analysis we find evidence that firms sometimes decreased serving size to make it easier to meet the 12 grams standard.

the strategic use of regulation is beyond the scope of this paper, in part, because a full examination of this subject calls for a model of the political economy of regulation. Furthermore, given the potentially strategic use of regulation, whether the regulation in question is on net beneficial or harmful to the industry or society is an open question. Our data prevent a full investigation of this question, but we note that the children's segment experienced a post-regulation sales decline while average prices increased. These outcomes are consistent with a decrease in competitiveness for structural reasons (e.g., exit) or possibly the market participants found themselves in a less competitive equilibrium.

Chapter 3

CEO Activism, Consumer Polarization, and Firm Performance

3.1 Introduction

"It doesn't matter how many people hate your brand as long as enough people love it."

— Phil Knight, co-founder, Nike

During one August weekend in 2019, two mass shootings in the United States killed 31 people and reignited a perennial, contentious debate over gun policy. Several weeks later, at least 146 CEOs of prominent companies joined the discussion by urging Congress to pass new gun control measures. Their activism is just one of several examples in recent years of CEOs speaking out about controversial issues that do not directly affect their business. Other examples include the CEO of Nike supporting Black Lives Matter, the CEO of Chick-fil-A opposing same-sex marriage, and more than 75 CEOs supporting access to abortion.

CEOs considering whether to take public positions on controversial issues that are not directly related to their business may anticipate several potential tradeoffs. Emerging research suggests that activism may align a firm with its employees' values (Bermiss & McDonald, 2018; Burbano, 2020) and create positive brand associations for consumers who agree with the CEO's position (Chatterji & Toffel, 2019; Panagopoulos *et al.*, 2020). Although CEO activism can differentiate a firm, it may also be controversial with many consumers. Therefore, its net effect on performance is unclear; the relative gains and costs associated with consumers who agree and disagree with the CEO are unknown (Mikeska & Harvey, 2015).

Unfortunately for wary executives, CEO activism cannot be covert (Werner, 2017) and staying silent may also be costly: survey evidence suggests that 65 percent of consumers want CEOs to speak on major social issues (Larcker *et al.*, 2018). Although many CEOs speak out on controversial topics (Chatterji & Toffel, 2018), the evidence on the effect of such activism

remains insufficient to inform strategy. This paper adds observational evidence to the growing literature on how CEO activism affects firm performance and emphasizes two novel observations about activism: (a) polarization can create asymmetry in the effects on liberals and conservatives and (b) persistence in CEO activism's effects over time has implications for its strategic use. We use a large sample of mobile phone location data to measure how store-level foot traffic (a proxy for sales) is affected by CEO support for gun control. Our research using observational data complements recent research on consumer reactions to CEO activism, which has so far relied on surveys and experiments to measure purchase intentions (Mikeska & Harvey, 2015; Chatterji & Toffel, 2019; Panagopoulos *et al.*, 2020) or emphasized corporate governance issues and the prevalence of activism rather than its effects on consumers (Mayer, 2017; Larcker *et al.*, 2018). Furthermore, our data's granularity allows us to examine both activism's net effects and its effects in geographic areas more or less likely to support stricter gun control policies. We find that CEO activism supporting gun control has a small, negative net effect on sales of about three percent but polarizes consumer spending. The impacts on likely supporters and opponents of gun control are asymmetric. Store visits do not change in the most politically liberal counties, but drop by about five percent in the most politically conservative counties. These effects, however, dissipate within a few weeks.

The strategy literature has mainly focused on differentiation in the market setting through product attributes, but the potential of CEO activism to polarize consumers suggests that executives could strategically use this, too, to differentiate their companies' products. Scholars have already shown that firm actions in the *non-market* environment can affect competitive dynamics in the market. Flammer (2015) finds that U.S. firms increased their corporate social responsibility (CSR) activities as a result of increased foreign competition, while Hull and

Rothenberg (2008) find that firms can use corporate social performance to improve financial performance. Adding to this research stream, we examine how non-market activities can affect firm performance. However, unlike most CSR activities, CEO activism often addresses issues that are highly controversial among consumers, making its effect on performance theoretically less clear. For example, on the issue of gun control, fewer than 50 percent of consumers think it is appropriate for companies to take positions compared to 75–85 percent who support activism related to issues such as pay equality or the environment (Chatterji & Toffel, 2018).

Our findings contribute to nascent research on CEO activism and to the broader literature on non-market strategy. First, we offer evidence on the effects of CEO activism using granular, store-level data. Thus, our results contribute to a body of evidence that can inform managerial decisions about whether to engage in activism. Second, we contribute to the non-market strategy literature by explicitly measuring the market consequences of non-market actions (Baron, 1995; Baron, 2001; de Figueiredo, 2009; Shotts, 2015; Oberholzer-Gee & Yao, 2018). Taking advantage of a triggering event (back-to-back mass shootings), we reduce the number of confounding factors that can affect observed outcomes. These advantages help us to more concretely connect non-market actions with market outcomes and alleviate identification concerns noted in previous research (Bonardi, Holburn & Vanden Bergh, 2006).

The remainder of the paper is organized as follows: Section 3.2 describes the activism event we study: CEO support for gun control in September 2019 following two mass shootings. Section 3.3 discusses relevant theories of how CEO activism may affect consumer behavior. Sections 3.4 and 3.5 explain the data and methodology, respectively. Section 3.6 presents our results and Section 3.7 concludes.

3.2 CEO Activism On Gun Control

On August 3 and 4 of 2019, two mass shootings—the first in a Walmart in El Paso, TX, and the second in a popular downtown area of Dayton, OH—killed 31 people and reignited debates over gun policy in the United States. Within a day of the shootings, Ohio Senator Sherrod Brown and Senate Minority Leader Chuck Schumer pressed for an emergency session in the Senate to vote on the Bipartisan Background Checks Act of 2019, a bill introduced in January 2019 that had earlier passed the House of Representatives. The bill, which was never passed, would have expanded background checks for gun purchases.

In the month after the shootings, 145 CEOs from various industries collectively voiced their support for stricter gun control. In a September 12 letter sent to U.S. senators, they referred to gun violence as "a public health crisis that demands urgent action." They called on lawmakers to support expanded background checks and "red flag" laws that would enable courts to temporarily limit firearm possession by individuals at risk of hurting themselves or others (Chesky *et al.*, 2019). In a similar letter sent to lawmakers on September 3, Doug McMillon, the CEO of Walmart, explained that the company would stop selling certain firearms and ammunition, encouraged lawmakers to support expanded background checks (that is, a "red flag" law), and called for a debate on reauthorization of the federal assault weapons ban that had expired in 2004 (Johnson, 2019).

News of these CEOs' support for gun control quickly spread through major news and social media channels such as *The Wall Street Journal*, *The New York Times*, *USA Today*, ABC's evening television news broadcast, and Twitter (Bomey, 2019; Kapner, 2019; Muir, Angeles & Karl, 2019; Nassauer & Lucey, 2019; Sorkin, 2019). Additionally, the National Rifle Association weighed in on the day of Walmart's letter and again the following week, characterizing

McMillon's stance on gun policy as "a bridge too far" and suggesting that the move would "risk alienating whatever remaining pro-gun shoppers [Walmart had] left" (NRA, 2019).

3.3 Theory and Hypothesis

CEO activism on controversial issues such as gun control, abortion, and LGBTQ rights can differentiate a firm from its competitors. For example, by supporting gun control, McMillon established Walmart as a company that cares about gun safety. As retailers' positions on gun control diverge, they become attributes consumers can consider when choosing where to shop. As with other non-quality product attributes, consumers likely differ in their taste for patronizing stores whose CEOs take different positions on controversial issues. Support for gun control may please one group of customers and antagonize another, potentially polarizing a firm's consumers. As a result, the net effect of CEO activism on firm performance is theoretically unclear.

To understand how CEO activism interacts with consumers' values to affect performance, we draw from the political science literature on affective polarization and lifestyle politics. We argue that CEO activism on polarizing issues is likely to asymmetrically affect consumers who agree and disagree with the CEO's position. Additionally, we consider reasons why activism's effects may be short-lived and discuss the strategic implications of this.

3.3.1 Polarization and Asymmetric CEO Activism Effects on Consumers

Given that CEO activism issues are often politically charged—especially the issue we study, gun control—we begin by examining polarization through the lens of political science theory. In this literature, there are two dominant theories of why groups become polarized: ideological polarization and affective polarization (Iyengar *et al.*, 2019). Theories of ideological polarization argue that the public is increasingly divided on issues, citing increasing differences in Democrats' and Republicans' views on defense spending, health insurance, and abortion,

among other issues (Abramowitz & Saunders, 2008). Affective polarization argues that polarization is driven by how people see members of the opposite political party (that is, Democrats versus Republicans) (Fiorina, Abrams & Pope, 2005).

Both types of polarization could influence the effect of CEO activism on store performance. In terms of ideological polarization, consumers who disagree with a CEO's activism may want to avoid financially supporting a business that advocates against their interests. For example, hunters might avoid patronizing Walmart because they believe such spending will strengthen the company's advocacy for stronger gun control laws. Consumers who support stricter gun laws may do the opposite.

In terms of affective polarization, consumers may change their behavior based on whether they perceive a CEO's actions as aligning with their preferred political party, regardless of their ideological views about gun policy (Fiorina, Abrams & Pope, 2008). Literature in sociology suggests that group affiliation is essential to our sense of self and that people instinctively think of themselves as representing broad categories rather than as distinctive packages of traits (Tajfel *et al.*, 1979; Brewer, 1991). People categorize those with the same beliefs as the ingroup, which triggers positive evaluations, and those with opposite beliefs as the outgroup, which triggers negative evaluations (Billig & Tajfel, 1973). In the case of CEO activism, consumers who affiliate with a political party may characterize a firm as either the ingroup or the outgroup based on its CEO's political stance. Consumers may then wish to purchase products from perceived co-partisans. The phenomenon of consumers finding social and political meaning in purchases is termed "lifestyle politics," a powerful force that can affect spending behavior, recreational experiences, and fashion decisions (Bennett, 1998; Shah *et al.*, 2016).

Given that most CEO activism issues—such as gun control, abortion, and LGBTQ rights—are politically charged, it is difficult to separate ideological versus affective polarization. The two are not mutually exclusive and theoretically their effects on firm performance have the same sign. We therefore focus not on the specific forces but on their combined effects on firms. Although the political science literature discusses the potential effects of polarization, (Fiorina, Abrams & Pope, 2008; Snyder, 2019; Panagopoulos *et al.*, 2020), less is known about the potential for asymmetric effects of polarization on different parties. Specifically, it is not known whether proponents and opponents will show a similar level of response toward a firm after its CEO takes an activism stance. One reason to expect asymmetry in responses is that the importance or salience of an issue for proponents and opponents of a CEO's position may differ. For example, Democrats and Republicans frequently disagree about the importance of issues such as climate change, racism, gay rights, abortion, and immigration (Brenan, 2020). Furthermore, certain issues are more likely to have personal stakes for proponents and opponents. With respect to gun control, Republicans are more likely to own guns, oppose gun control, and say that being a gun owner is important to their identity (Parker *et al.*, 2017). Gun owners, especially Republican gun owners, therefore have personal stakes in the resolution of policy issues related to firearms. As a result, gun owners tend to be more politically engaged on the issue of gun control (Goss, 2006); they are nearly twice as likely to contact public officials about guns and nearly three times more likely to donate money to organizations with positions on guns (Parker *et al.*, 2017).

Another, psychological, reason to expect asymmetric responses from proponents and opponents of a CEO's position is that consumers may respond to what for them is positive versus negative information about a firm differently. Asymmetric responses to positive and negative

information have been studied most explicitly in the psychology literature. Taylor (1991) presented evidence that negative events elicit more physiological, affective, cognitive, and behavioral activity, leading to more cognitive analysis than neutral or positive events do. Research also indicates that subjects tend to experience stronger physiological arousal when presented with opinions that contradict rather than support their own (Burdick & Burnes, 1958; Steiner, 1966) and that negative events are stronger determinants of mood than positive events (Vinokur & Selzer, 1975; Taylor, 1991).

Studies also show that positive and negative events and information do not seem to have the same effect on cognitive processing (Kanouse & Hanson, 1972). Peeters and Czapinski (1990) find that negative stimuli lead to more cognitive work and produce more complex cognitive representations than positive stimuli do. This translates to individuals assigning more importance to negative information—that is, social information such as learning that a CEO has taken a stance that opposes one's own belief—than to positive information (Peeters & Czapinski, 1990; Kahneman & Tversky, 2013). Negative information outweighs positive information in impression formation, person perception, and morality judgments (Kanouse & Hanson, 1972). It is conceivable, then, that consumers who disagree with a CEO will react more strongly than those who agree. In our setting, we expect consumers who oppose stricter gun control policies to exhibit greater response than those who support stricter gun control.

3.3.2 Duration of CEO Activism Effects

Consumer choice is driven by several factors, such as price, convenience, and quality. The weight consumers put on CEO activism versus other factors is unknown. When Walmart's CEO took a stance on stricter gun control policies, the company's strategy of offering low prices on a wide selection of goods did not change. This suggests that consumers who chose to avoid or

patronize Walmart due to CEO activism likely incurred costs along other dimensions (e.g., prices, convenience, quality).

In addition, whereas other attributes will remain salient, consumers are likely to forget about any CEO activism absent continuous reminders. Research shows that consumers have limited attention in dealing with frequent activities such as household finances (DellaVigna, 2009; Stango & Zinman, 2014) and are often overloaded with competing information from advertisers (Anderson & de Palma, 2013). Even the effects of persuasive advertising are not permanent; increases in goodwill generated by advertising decay over the following weeks and firms must engage in intermittent advertising, or "pulsing," to sustain the benefits of their marketing efforts (Dube, Hitsch & Manchanda, 2005; Lopez, Liu & Zhu, 2015).

Economic research on transient, visceral emotions suggests that visceral factors often drive people to behave in ways that they view as contrary to their own self-interest (Loewenstein, 2000). This stream of research suggests that at times—for example, when feeling road rage—people are biologically prone to make certain decisions with low cognitive mediation (LeDoux, 1996). When immediate visceral factors overpower cognitive deliberation, people take actions based on how they feel rather than on the expected consequences. In the case of CEO activism, upon learning of a CEO's stance, consumers may act in ways that are not in their best economic interest, be that avoiding or supporting a particular company. However, given that visceral emotions are temporary (road rage, for example, fades quickly), consumer behavior towards a specific company should also quickly return to its original state. Additionally, consumers—aware of a past or current visceral emotion's negative influence—may resist the behavioral impact of future visceral factors (Loewenstein, 2000). Taking such effects together with

consumers' limited attention span, we anticipate that the effects of CEO activism will be short-lived.

3.4 Data

We combine data from three sources to examine how CEO support for stricter gun control affects firm performance. First, to measure store-level performance, we rely on mobile phone location data from SafeGraph. Second, we identify CEOs who supported gun control legislation in September 2019 by searching several news databases. Third, we match store locations to data on recent presidential elections from the MIT Election Lab to examine whether consumers' responses to CEO activism depend on their political affiliations. We discuss each of our primary data sources in greater detail below and in the Appendix.

3.4.1 Store-level Performance

We measure weekly visits to individual stores from 2017 through 2019 using data from SafeGraph, a company that tracks foot traffic to millions of U.S. stores using mobile phone location data.[33] The SafeGraph sample is generally representative of the U.S. population, including on demographic variables such as race, education, and income (Squire, 2019).[34] We discuss the SafeGraph data in detail, including how well it represents the U.S. population and how we calculate store visits, in the Appendix.

CEOs from 146 companies supported gun control in early September 2019, but because our study focuses on consumers and relies on physical store visits to measure performance, we subset our data to include only firms with physical store locations. Thus, our sample consists of

[33] Technically, SafeGraph tracks visits to places, which may or may not be stores; a daycare center, for example, is not a store. We refer to places as "stores," however, because we restrict our analysis to those places that *are* stores.
[34] SafeGraph data exclude people under 13 years of age. This is unlikely to affect our results, given that stores in our sample do not target this specific consumer category and children have limited direct purchasing power.

four companies whose CEOs supported stricter gun control—Walmart, Dick's Sporting Goods, Levi Strauss, and The Gap—collectively accounting for 5,766 stores.

3.4.2 Corporate Activism and the Control Group

We examine consumer responses to CEO support for stricter gun control policies (see Section 0 for details) by comparing store visits for companies that did and did not engage in activism. To construct a control group using the SafeGraph data, we begin by selecting potential control firms from the universe of branded stores in the same counties and NAICS industries as our focal firms; we call these our "same-industry controls." Then, as an alternative control group for robustness checks, we use a list of brands that SafeGraph identifies as related to our focal firms in terms of foot traffic; that is, a consumer who patronizes the focal firm is also likely to patronize the related firm. We refer to this control group as our "related-brand controls" and provide more details about its construction in the Appendix. As we explain in Section 0, using these two control groups to construct counterfactual outcomes for the activist stores[35] is helpful because the likely biases in the estimates from each have opposite signs.

3.4.3 Political Affiliation

Republicans generally favor fewer restrictions on the ownership and use of firearms. Furthermore, gun ownership has become more partisan over the past three decades and is now a reliable predictor of voting Republican (Joslyn *et al.*, 2017). In fact, gun ownership in recent years has emerged as a better predictor of party affiliation than gender, sexual orientation, ethnicity, and several other demographic variables (Silver, 2012). Opinion polls by the Pew Research Center that coincide with the time period of this study suggest that gun control is

[35] It is CEOs, not stores, who engage in activism, but, in this model, the effects of the activism are reflected in store-level performance. For simplicity, we refer to stores that are part of a company whose CEO has engaged in activism as "activist stores."

among the most polarizing issues; 76 percent of Republicans—but only 22 percent of Democrats—say it is more important to protect gun rights than to control gun ownership (Parker *et al.*, 2017). Therefore, political party affiliation is likely to be a good proxy for consumers' agreement with CEO activism favoring stricter gun control.

We measure political leaning using county-level data from the MIT Election Lab (MIT Election Data and Science Lab, 2018). To measure how conservative a given county's consumers are, we calculate the average of the shares of votes cast for the Republican presidential candidate in each county during the 2008, 2012, and 2016 general elections. As election data are not available for Alaska or U.S. territories,[36] we exclude these locations from all analyses.

3.4.4 Summary statistics

Table 3.1 shows summary statistics for our sample and Table 3.2 reports means and standard deviations separately for the treatment and control stores. The stores in our sample receive an average of 1,746 visits per week and are balanced between Democrat- and Republican-leaning counties. A map of stores included in the sample (Figure 3.1) shows they are spread across nearly all counties of the United States.

[36] These territories are American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

Table 3.1: Full-sample summary statistics.

Variable	Mean	Std. dev.	10th	25th	50th	75th	90th
Activist	0.16	0.37	0	0	0	0	1
Store visits	1,746	2,960	199	372	664	1,311	5,372
Republican vote	50 pct	15	30	40	49	61	70

Note: Observations are store-weeks. The variable Activist is an indicator for stores whose CEOs took public positions on gun control. Store visits is weekly scaled store visits as defined in Appendix A. Republican vote is the average of the percentage of total votes cast for the Republican presidential candidate in the 2008, 2012, and 2016 general elections within the store's county.

Table 3.2: Summary statistics for activist and non-activist (control) stores.

	Activist stores		*Same-industry controls*		*Related-brand controls*	
	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev
Store visits	6,160	4,531	886	1,389	1,463	5,316
Republican vote	50 pct	14	50	15	48	16

Note: Observations are store-weeks. See notes to Table 1 for variable definitions.

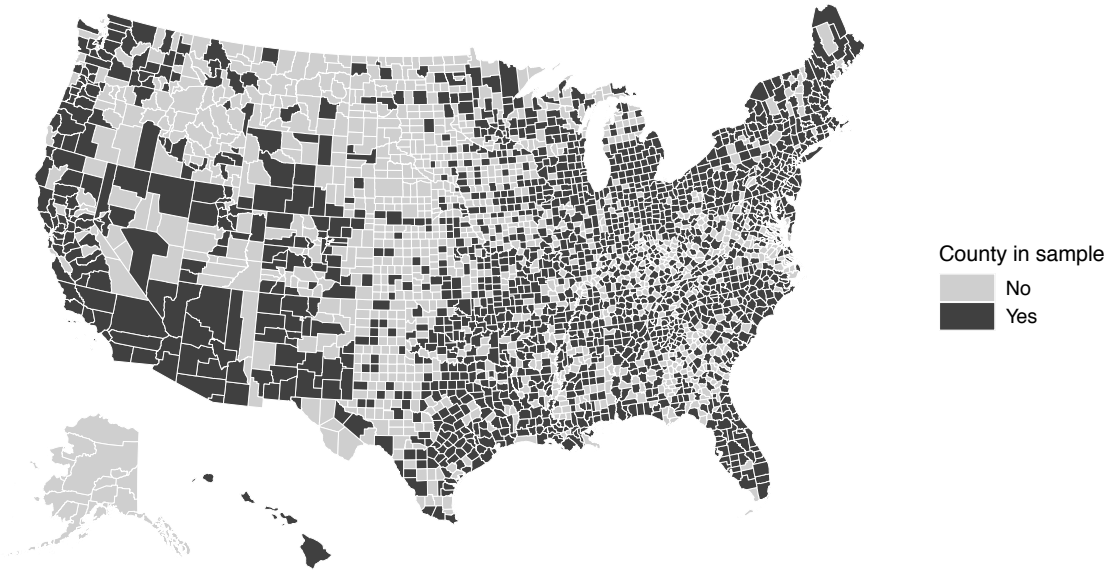


Figure 3.1. Map of counties with both activist and same-industry control stores

3.5 Methodology

We measure the effects of corporate activism on performance using difference-in-differences methods that leverage recent methodological advances to account for potential violations of the parallel trends assumption (Bilinski & Hatfield, 2018). Our targets of inference are (a) the average treatment effect for the treated (the effect of activism on the performance of brands whose CEOs take public positions on gun control) immediately following the treatment (CEO activism) and (b) average treatment effects conditional on political affiliation. The starting point for our analyses is the familiar two-way fixed-effects model with additional controls for seasonality:

$$\ln Y_{it} = \beta D_{b(i)\,t} + \alpha_i + \lambda_{k(i)n(i)t} + \delta_{i\,w(t)} + \theta_{i\,y(t)} + \epsilon_{it}, \qquad (1)$$

where Y_{it} is the number of visits to store i in week t and $D_{b(i)\,t}$ is an indicator for whether store i's parent brand b engaged in corporate activism related to gun control in or before week t.[37] The parameter α_i is a store fixed effect that captures unobserved store-level attributes (such as square footage and location) that do not vary across years. The second fixed effect, $\lambda_{k(i)n(i)t}$, is a county-industry-time–specific parameter that absorbs shocks to foot traffic in period t for store i's county ($k(i)$) and industry ($n(i)$), the latter identified by six-digit NAICS code.[38] This effect accounts for unobserved factors at time t that equally affect all stores in a given county and industry. The terms $\delta_{i\,w(t)}$ and $\theta_{i\,y(t)}$ are store-level, seasonal effects for each week of the year and for the year, respectively.[39] These fixed effects adjust for the fact that some stores may

[37] The function $b(i)$ maps store i to brand b. Because the CEO activism events occurred midweek, our indicator in the initial activism period equals the fraction of the week that occurred post-activism.
[38] The function $k(i)$ maps store i to its county location; $n(i)$ is defined analogously for industry.
[39] Note that $\theta_{i\,y(t)}$ and α_i are not separately identified; including the former results in a model that nests the case of store-level effects that are constant across years (α_i). We show both here for exposition purposes. For estimation, we present both models that exclude seasonal effects (i.e., $\delta = \theta = 0\ \forall\ i$) as well as models that allow for seasonality.

regularly have higher sales at certain times of the year. For example, we might expect a Walmart to have higher sales than other stores each year around the time students return to school. The store-level fixed effect (α_i) captures the fact that Walmart stores have persistently higher foot traffic than other general merchandise stores but does not adjust for regularly occurring *seasonal* differences in the number of store visits. Our model adjusts both for Walmart's generally higher foot traffic and for seasonal performance patterns.[40]

Because we are interested in how the effect of activism depends on consumers' agreement with CEO support for stricter gun control policies, we also estimate versions of Equation (1)—and our other models—that interact CEO activism with continuous or categorical variables representing the average of the shares of voters who voted Republican in the 2008, 2012, and 2016 presidential elections; that is, we replace $\beta D_{b(i)\,t}$ in Equation (1) with $\left(\beta_1 + \beta_2 R_{k(i)}\right) D_{b(i)\,t}$, where $R_{k(i)}$ is average Republican vote share in store i's county.

In addition to Equation (1), we estimate "event-study"–style models with dynamic treatment effects that include indicators for each pre- and post-activism period:

$$\ln Y_{it} = \sum_{j=1}^{T} \beta_j \mathbb{1}\left(t = j \cap D_{b(i)} = 1\right) + \alpha_i + \lambda_{k(i)n(i)t} + \delta_{i\,w(t)} + \theta_{i\,y(t)} + \epsilon_{it}, \qquad (2)$$

where we omit the term for the period immediately preceding activism; that is, we let T_0, where $1 < T_0 < T$, be the period in which CEOs support gun control, so that $\beta_{T_0-1} = 0$. The average treatment effect for the treated is then the average of the treatment effects in the individual post-treatment periods:

$$\beta = \frac{1}{T - T_0 + 1} \sum_{j=T_0}^{T} \beta_j, \qquad (3)$$

[40] As we show in the results section, this seasonal adjustment is crucial in our setting; failing to adjust for seasonality would lead us to conclude that CEO activism has large negative effects on store visits. Taking into account seasonal patterns in performance, however, reveals that store visits regularly fall in early September and that activism on gun control had only modest net effects on store performance.

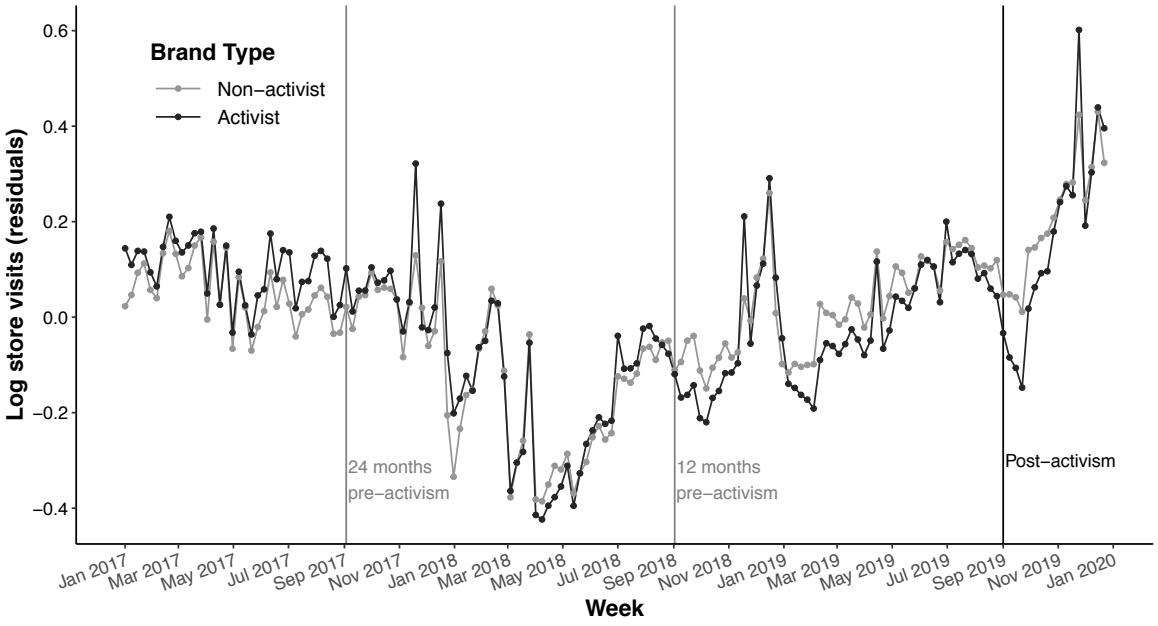
which is identified using the performance of stores associated with brands that did not engage in activism as a counterfactual for those that did. In our analysis, we focus on the 10-week period around the CEO activism and emphasize estimates of the individual β_j coefficients in the immediate post-activism period.

CEO activism is likely to have interesting dynamic effects. Specifically, it may have transitory effects on firm performance, with consumers responding immediately after the event, then reverting to normal behavior. Additionally, we believe our ability to attribute changes in store visits several weeks following the activism to CEO positions on gun control is limited. Stores exposed to negative effects of activism may adjust in unobserved ways—for example, by cutting prices, increasing marketing, or changing product offerings—which could confound our estimates.

3.5.1 Parallel Trends Assumption

Causal inference in our study design relies on the usual parallel trends assumption. In our setting, this means changes in log store visits for the control group reflect how visits would have changed in the absence of activism for stores whose CEOs took positions on gun control. Figure 3.2 shows store visits over time for activist stores and our same-industry control stores, and Figure 3.3 shows the same trends by political affiliation of stores' counties. The first week of CEO activism (in September 2019) is marked with a black vertical line. In the weeks immediately preceding activism, store visits in both the treatment and control groups typically increase and decrease concurrently, although the activist stores show a slightly steeper upward trend in the previous summer. Following the activism, there is a conspicuous drop in store visits for the activist stores relative to the control group, and the drop is larger in more conservative counties. However, in both figures, a similar pattern is also visible in other years despite no

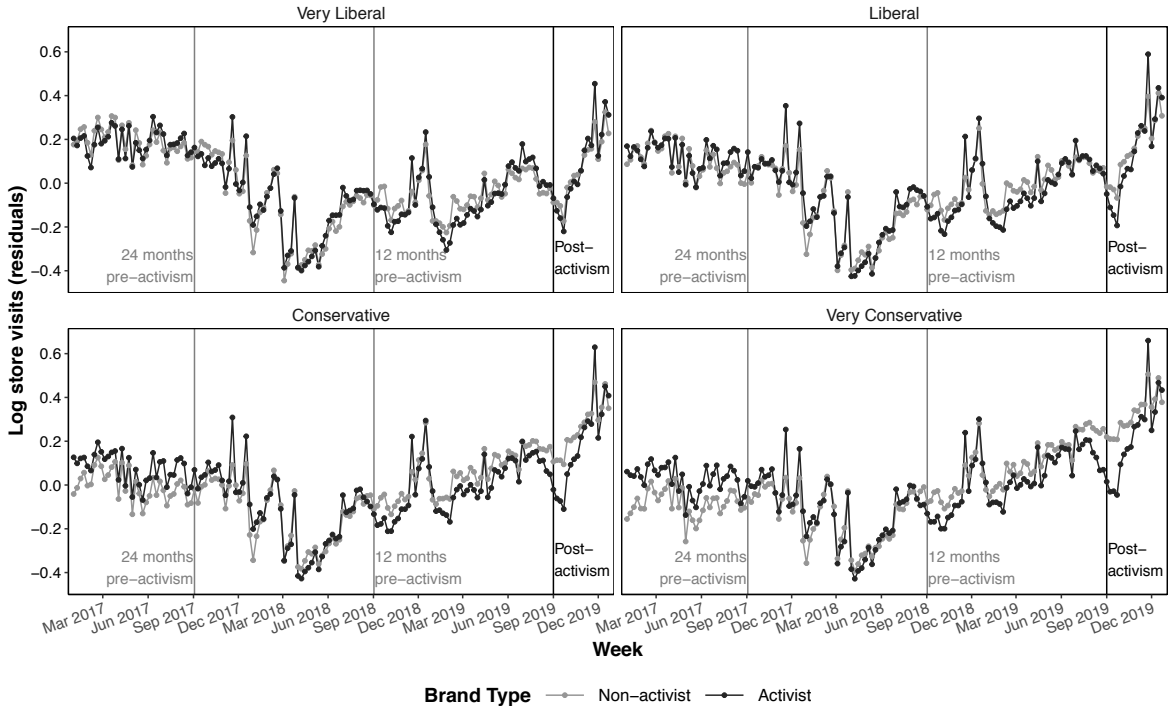
activism occurring during this period.[41] Below, we show in our results (Table 3.3) that estimates of Equations (1) and (2) that omit the seasonal terms attribute the steep decline in store visits in September 2019 to CEO activism even though the decrease is a regular feature of the data.



Note: Vertical lines are relative to CEO activism at Walmart, which occurred one week before the activism of the other sample stores. The plotted series represent mean log visits after residualizing with respect to store fixed effects.

Figure 3.2. Trends in store visits for activist and same-industry control stores

[41] This, too, illustrates the importance of modeling seasonality in our setting. Even controlling for counties and six-digit NAICS industries, store visits exhibit recurring seasonal patterns.



Note: See notes to Figure 3.2. Political categories are defined as in Table 3.3.

Figure 3.3. Trends in store visits by political affiliation of store location

Despite the similarity in pre-activism trends for the activist and non-activist stores, recent research on difference-in-differences methods cautions against using statistical tests to assess the plausibility of the parallel trends assumption (Bilinski & Hatfield, 2018; Roth, 2020). This work explains that traditional tests of pre-trends are often insufficiently powered to rule out meaningful violations of the parallel trends assumption. And even when they are sufficiently powered, the deviations from parallel pre-trends indicated by the tests may not meaningfully affect inferences about treatment effects of interest (Bilinski & Hatfield, 2018).

We therefore combine visual inspection of the data and estimates of pre-activism β_j's from Equation (2) with recent formal methods that account for potential violations of the parallel trends assumption. Following Bilinski and Hatfield (2018), we examine how differences in

trends between activist and non-activist stores affect our estimates by augmenting Equation (2) with either a linear or cubic spline time trend for activist stores:

$$\text{Ln}\, Y_{it} = \sum_{j=T_0}^{T} \beta_j \mathbb{1}\left(t = j \cap D_{b(i)} = 1\right) + f\left(tD_{b(i)}; \phi\right) + u_{it}, \quad (4)$$

where u_{it} encompasses the fixed effects and seasonal terms (see above) and $f\left(tD_{b(i)}; \phi\right)$ is a trend difference for activist stores parameterized by ϕ. For the model with a linear trend difference, $f\left(tD_{b(i)}; \phi\right) = \phi\ t\ D_{b(i)}$. For models with a nonlinear trend difference, we use a natural cubic spline with two degrees of freedom and a knot at the midpoint of the pre-activism period.[42]

3.5.2 Results

Table 3.3 shows results from a series of difference-in-differences models—see Equation (1)—estimating the net effect of CEO activism as well as effects in politically liberal versus conservative counties. The estimates in Column 1 are not adjusted for seasonal patterns in store visits (that is, they omit the δ and θ coefficients in Equation (1)), while those in Columns 2–6 (our preferred estimates) do control for seasonality. The difference in results illustrates the importance of correcting for seasonal trends in these data. The coefficient on *Post-activism* in Column 1 indicates that CEO support for gun control results in a 9- to 10-percent reduction in store visits over the four weeks following the event, while the estimate in Column 2 (adjusted for seasonality) indicates a more modest three percent decrease, which is equivalent to a reduction of 185 visits per week for the average activist store.

[42] Analyses were conducted in R (R Core Team, 2020).

Table 3.3: Difference-in-differences estimates.

	Weeks [-10, 4]				*Weeks [-10, 10]*	
	(1)	(2)	(3)	(4)	(5)	(6)
Post-activism	-0.097	-0.033	-0.006		0.005	-0.017
	(0.002)	(0.003)	(0.013)		(0.003)	(0.013)
Post-activism × Republican vote			-0.001			0.000
			(0.000)			(0.000)
Post-activism × Very liberal				-0.002		
				(0.014)		
Post-activism × Liberal				-0.034		
				(0.005)		
Post-activism × Conservative				-0.035		
				(0.005)		
Post-activism × Very conservative				-0.048		
				(0.009)		
Seasonality controls		Yes	Yes	Yes	Yes	Yes
Observations	647,265	1,941,795	1,941,795	1,941,795	1,941,795	1,941,795
R^2	0.97	0.96	0.96	0.96	0.96	0.96

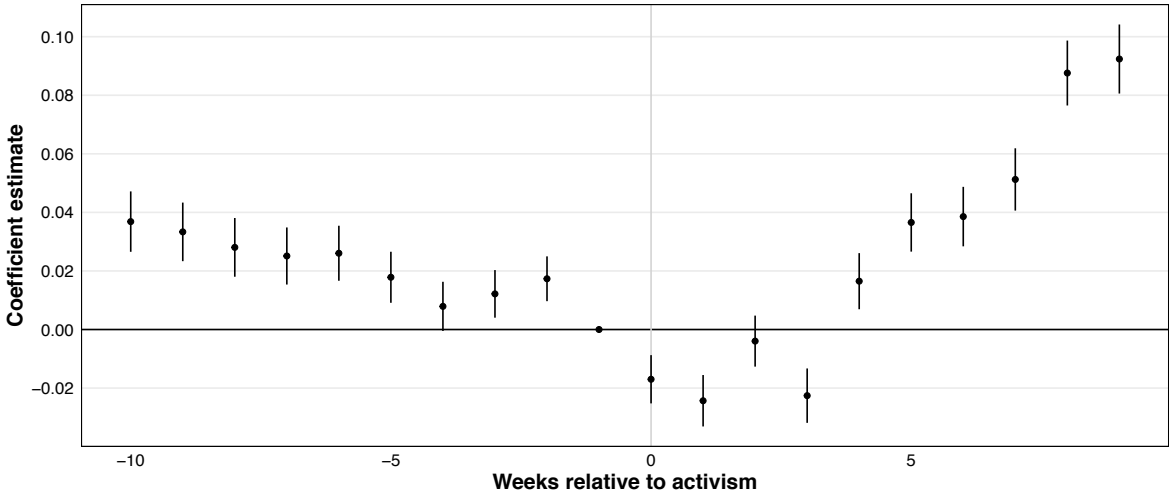
Note: All models include store and week-industry-county fixed effects. Models 1–4 cover the 10 weeks before and 4 weeks after the activism and Models 5–6 cover the 10 weeks before and 10 weeks after the activism. Model 1 uses data from 2019, while Models 2–6 additionally use data from 2017 and 2018 to control for week-of-year seasonality. Post-activism is an indicator for store-weeks after the CEO supported gun control. Republican vote is the average of the percentages of total votes cast for the Republican presidential candidate in the 2008, 2012, and 2016 general elections within the store's county. Very Liberal, Liberal, Conservative, and Very Conservative are categorical variables based on Republican vote; the cutoffs for each category are [0, 30], (30, 50], (50, 70], and (70, 100], respectively. Standard errors in parentheses are clustered by store.

Columns 3–4 of Table 3.3 show that the effect of CEO activism depends on the political affiliation of a store's consumers. Column 3 interacts the indicator for activism with the average of the shares of votes cast for the Republican presidential candidate in the store's county during the 2008, 2012, and 2016 presidential elections. As an alternative specification, Column 4 replaces this continuous measure with indicators for four categories of Republican support: *Very liberal* areas are those in which Republicans receive 30 percent or less of the vote, *Liberal* areas 31–50 percent, *Conservative* areas 51–70 percent, and *Very conservative* areas 71–100 percent. Both specifications indicate that consumers in more conservative counties respond more negatively to CEO support for gun control. The point estimates in Column 3 imply that stores in counties where Republicans typically win 25 percent of the vote see a 1.9-percent decrease in visits following CEO support for gun control, but stores in counties where Republicans typically

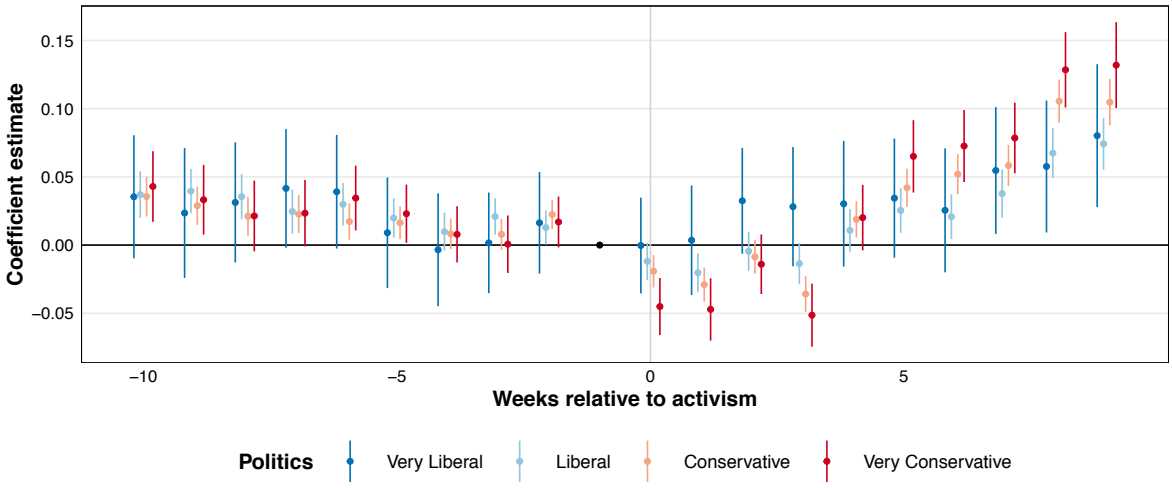
win 75 percent of the vote experience a 4.6-percent decrease in visits. Similarly, in Column 4, the point estimate for *Very liberal* counties implies that visits do not change while estimates for *Very conservative* counties indicate that visits decrease by five percent during the four weeks following CEO activism. Together, these results suggest that CEO activism has an asymmetric polarization effect on consumers: consumers who disagree with the CEOs' stance on gun control react more strongly to it than other consumers.

To examine the duration of the effects of activism stretching beyond four weeks, we extend the sample in Columns 5 and 6 of Table 3.3 to cover the 10-week period after CEO support for gun control. The estimates in these columns indicate that activism has essentially no net effect on store visits over this 10-week period, suggesting that any decline in sales immediately following CEO support for gun control was later reversed. Next, we explore the pattern of dynamic effects week by week, but before doing so, note how the magnitude of our estimates in Table 3.3 compares with the effects reported in related experimental studies. Chatterji and Toffel (2019) examine how statements supportive of same-sex marriage by Tim Cook, the CEO of Apple, affect consumers' intention to purchase Apple products. Mean purchase intent in their study was five percent higher for people exposed to Tim Cook's pro-LGBTQ-rights message versus a generic message regarding his business philosophy. Like us, Chatterji and Toffel find that the effect of activism depends on the audience. In experiments examining how consumers respond to information about corporate political contributions, Panagopoulos *et al.* (2020) find that consumers become "more (less) likely to patronize chains that support (oppose) their [political] party." Pooling the results of several experiments, they report that the share of consumers who plan to "never patronize a [particular] chain store" moves

four percentage points in either direction depending on the alignment of that company's political contributions with consumers' own political views.



(a) Pooled analysis



(b) Effects by county political affiliation

Figure 3.3. Effect of CEO activism by week

The estimates in Table 3.3 reflect the average effect of CEO activism in the month following the event. In order to investigate the dynamic effects of activism, we estimate the model in Equation (2), which includes indicators for each week pre- and post-activism (omitting the period immediately prior to activism). Figure 3.4 plots the individual coefficients for the net effect of CEO activism as well as effects by political affiliation (using the same categories as Table 3.3). We first focus on interpretation of the post-activism coefficients, then on the pre-period coefficients and parallel trends assumption.

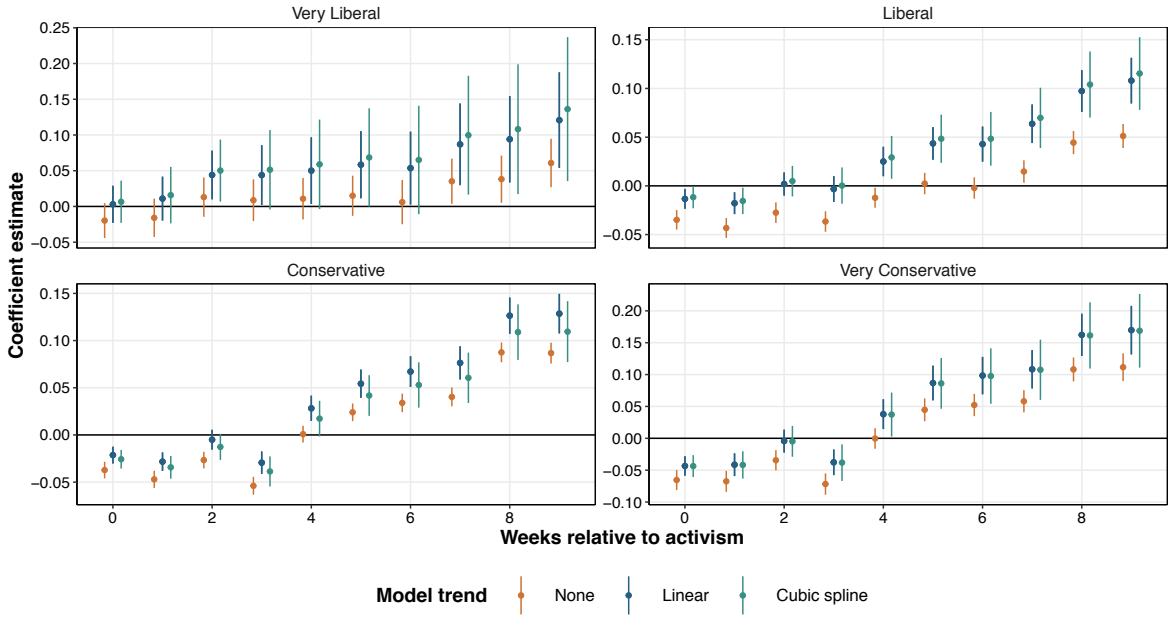
Figure 3.4(a) shows that store visits decrease about two percent in the weeks immediately following CEO support for gun control, but quickly recover. Figure 3.4(b) shows effects by political party and, like Table 3.3, suggests that store visits decrease more in counties with more Republican voters. There is a sharp change in the pattern of store visits across liberal and conservative counties following activism: they perform similarly pre-activism, but diverge immediately afterwards. Very conservative counties—those in which more than 70 percent of voters typically support the Republican candidate for president—see weekly store visits fall five percent following CEO activism. The estimates in Figure 3.4(b), however, also indicate that the number of store visits was *greater* in more conservative counties five weeks following activism. One possible interpretation is that consumers who disagree with a CEO postpone store visits immediately following activism, but soon return to make up for missed trips. The results, however, are consistent with several explanations and should be interpreted cautiously because changes in store visits—especially several weeks following activism—may reflect unobservable actions taken by store managers rather than a direct, dynamic effect of CEO activism. For example, declining store visits may lead stores to lower their prices, increase marketing, or take

other actions that increase sales. We further discuss the implications of these patterns in Section 0 and note that research on CEO activism has not adequately measured its longer-term and dynamic effects on consumption, which is crucial for analyzing its full potential for product-market differentiation.

The coefficient estimates in the pre-activism period (Figure 3.4) indicate possible violations of the parallel trends assumption (see Section 0 for discussion of this assumption), which might affect inferences about the effects of activism. The pre-period coefficients in Figure 3.4(a) are close to zero, but show a downward trend in the weeks immediately preceding activism. The coefficients in Figure 3.3(b) likewise suggest that visits to activist stores were higher, but declining, relative to other stores prior to activism.

Recent work on difference-in-differences, however, cautions *against* using pre-period coefficients like those in Figure 3.4 to assess the plausibility of the parallel trends assumption (Bilinski & Hatfield, 2018; Roth, 2020). First, estimates of single-period effects may be insufficiently powered to detect important violations of the parallel trends assumption (Bilinski & Hatfield, 2018; Roth, 2020). Second, even when traditional hypothesis tests reject that the pre-period effects are zero, the deviations may have little practical significance for inferences about the effects of interest (Bilinski & Hatfield, 2018). Furthermore, Roth (2020) shows that conditioning publication of and inferences about treatment effects on "passing" a test of pre-trends can *exacerbate* bias. Instead of testing pre-trends or examining the statistical significance of pre-period coefficients, researchers can quantify how violations of the parallel trends assumption affect inference and the sensitivity of the results to plausible violations. To do so, we implement the method of Bilinski and Hatfield (2018)—see Equation (4)—to examine the

sensitivity of our estimates to potential linear and nonlinear violations of the parallel trends assumption.

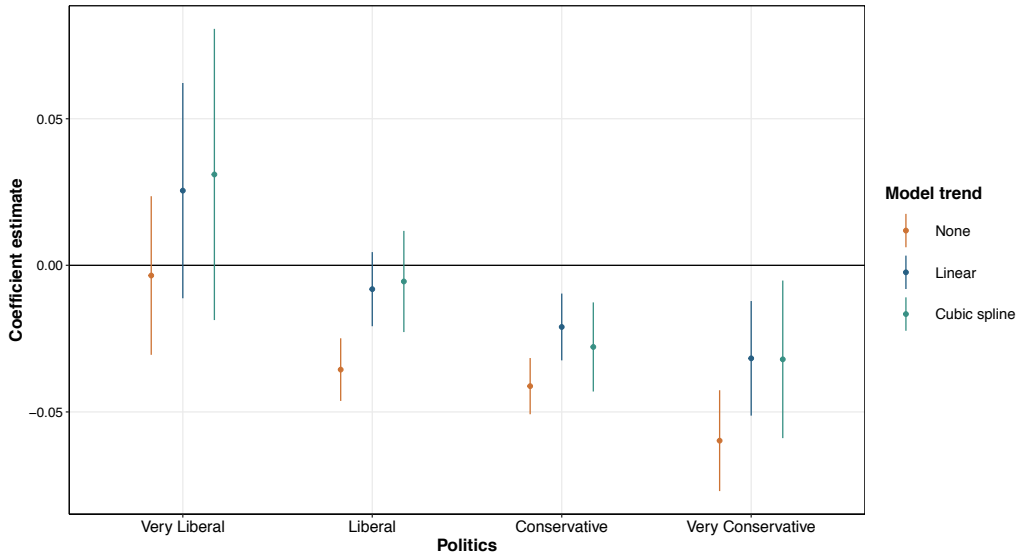


Note: Political categories are defined as in Table 3.3.

Figure 3.4. Effect of deviations from parallel trends on estimates

Figure 3.5 shows how the post-activism estimates in Figure 3.4(b) change when the model includes a differential (linear or cubic spline) trend between activist and non-activist stores. Coefficient estimates including either a linear (shown in dark blue) or cubic (shown in green) trend are generally larger than those from a model that assumes parallel trends (shown in orange). Estimates including these differential trends, however, are overall similar in magnitude to those of the model without a differential trend and likewise show larger effects of activism in very conservative counties than in very liberal ones. Note that estimates from the model including a cubic spline trend difference are essentially indistinguishable from estimates assuming a linear trend difference between activist and non-activist stores, which suggests that

the trend difference between the two groups is linear. There is evidence under all models that CEO activism polarizes consumers immediately following the event. The differences in activism effects between very liberal and very conservative counties in both the first and second week post-activism are between 4.5 and 5.2 percentage points and statistically different from zero in all models.



Note: Political categories are defined as in Table 3.3. Average treatment effects are estimated over the four weeks following activism.

Figure 3.5. Average treatment effects conditional on political affiliation

Figure 3.6 shows estimates of the average treatment effect conditional on political affiliation over the four weeks following activism—see Equation (3). Again, all models suggest that stores in liberal counties experience either no change or slightly positive effects from activism while stores in conservative counties experience decreases in store visits.

3.6 Robustness Checks

We examine the robustness and sensitivity of our results to the composition of our control group, the measure of political affiliation, and the exclusion of individual states.

3.6.1 Alternative Control Group

Our estimates in Table 3.3 and Figures 4–Figure 3.5 rely on a sample of same-industry control stores and may therefore be biased due to substitution effects. For example, using Target stores to construct counterfactual outcomes for Walmart stores will bias our estimates (they will be too large in magnitude) if consumers respond to CEO activism by switching from Walmart to Target or vice versa. In other words, the same-industry controls may themselves be affected by a competitor's CEO activism.

Therefore, as an alternative control group, we use a list of brands that SafeGraph identifies as related to our focal firms—in terms of foot traffic—by examining the tendency of consumers to patronize both locations. For example, if people who shop at a downtown Walmart also visit a nearby Shell gas station more frequently than do other shoppers, SafeGraph will label the Shell brand as related to that specific Walmart. We provide more specifics about this procedure, including the precise formulas used, in the Appendix. We refer to this control group as our "related-brand controls."

Fortunately, the expected bias when using the related-brand controls has a sign opposite to that of the same-industry controls. The related-brand controls avoid the substitute problem, but potentially suffer from a complements problem due to consumers purchasing their products jointly with those of the activist firm. For example, a Shell gas station may rely on consumers from a nearby Walmart.[43] If those consumers stay away from Walmart, the Shell station will lose revenue. In this case, our estimates will be biased in the other direction—they will be too small in magnitude—because a decrease (increase) in visits to the activist stores will be matched by a

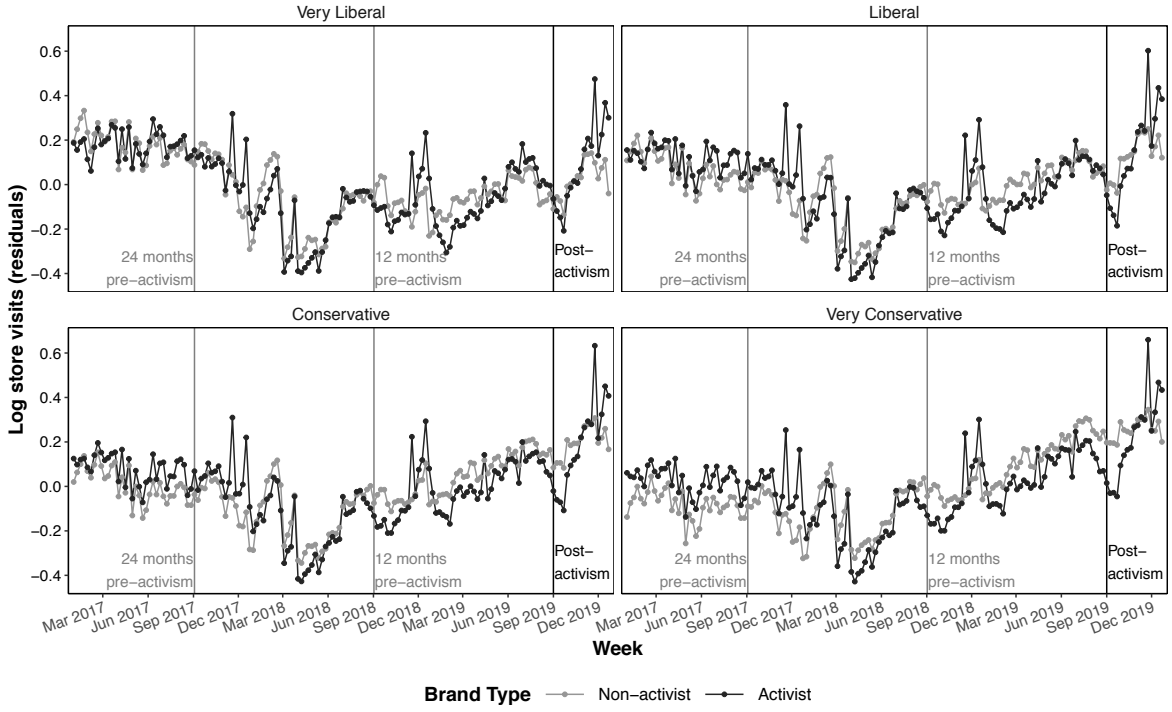
[43] "Anchor stores" in malls are another example of this phenomenon (Konishi & Sandfort, 2003). Large retailers attract consumers to a shopping center, which benefits smaller, proximate retailers. Any harm to the anchor has negative spillover effects on smaller businesses nearby.

decrease (increase) in visits to the related-brand control stores. Having two control groups that are likely to bias the estimates in opposite directions allows us to examine whether the above biases meaningfully effect our estimates.

Because related brands are typically not in the same industry as the activist stores, we adapt the industry-county-time fixed effects in Equation (1) to control for groupings of stores and their related brands:

$$\ln Y_{it} = \beta \mathbb{1}\left(t > T_0 \cap D_{b(i)} = 1\right) + \alpha_i + \lambda_{g(i)t} + \delta_{i\,w(t)} + \theta_{i\,y(t)} + \epsilon_{it}, \tag{5}$$

where $\lambda_{g(i)t}$ is now a fixed effect for a store and its related-brand stores in each period. For example, a Walmart and its related Shell station would be grouped—that is, would have identical values of $g(i)$—to control for common shocks in each period. The effect of activism (β) is then identified from deviations in visits to Walmart versus the Shell in the post-activism period.



Note: See notes to Figure 3.2. Political categories are defined as in Table 3.3.

Figure 3.7. Trends in store visits for related-brand controls by political affiliation of store location

Figure 3.7 shows trends in store visits for the activist and related-brand controls by political affiliation of the store's county. Like Figure 3.3 (see Section 5.1), it supports the parallel trends assumption, suggesting that both the same-industry and the related-brand control groups provide plausible counterfactuals for stores whose CEOs supported gun control.

Table 3.4: Difference-in-differences estimates using related-brand control group.

	Weeks [-10, 4]			*Weeks [-10, 10]*	
	(1)	(2)	(3)	(4)	(5)
Post-activism	-0.038	-0.029		0.006	-0.023
	(0.003)	(0.010)		(0.003)	(0.010)
Post-activism × Republican vote		-0.000			0.001
		(0.000)			(0.000)
Post-activism × Very liberal			-0.021		
			(0.012)		
Post-activism × Liberal			-0.040		
			(0.005)		
Post-activism × Conservative			-0.038		
			(0.004)		
Post-activism × Very conservative			-0.041		
			(0.007)		
Seasonality controls	Yes	Yes	Yes	Yes	Yes
Observations	5,136,030	5,136,030	5,136,030	6,848,040	6,848,040
R^2	0.96	0.96	0.96	0.96	0.96

Note: All models include store and week-store-pair fixed effects. Models 1–3 cover the 10 weeks before and 4 weeks after the activism and Models 4–5 cover the 10 weeks before and 10 weeks after the activism. See note to Table 3 for variable definitions. Standard errors in parentheses are clustered by store.

Table 3.4 shows that results using the related-brand control group are similar to those using the same-industry controls (Table 3.3). The estimates in Column 1 (corresponding to Column 2 of Table 3.3) suggest that weekly visits to activist stores decrease three to four percent over the month following activism. Likewise, Columns 2–3 of Table 3.4 show that the effect of CEO activism on a store depends on the political affiliation of its customers. The more conservative a county's voters, the greater the decrease in visits to stores whose CEOs support

gun control; stores in the most conservative counties experience about a four percent decrease in visits while stores in the most liberal counties see decreases of about two percent.

3.6.2 Alternative Political Ideology Measures

Our main results demonstrating consumer polarization rely on the average of the Republican vote shares in the 2008, 2012, and 2016 general presidential elections. As two alternative measures, we use Republican vote share in only the 2016 election—the most recent election preceding the activism—and county-level estimates of policy preferences from the American Ideology Project (Tausanovitch & Warshaw, 2013).[44] The latter measure pools data from several national surveys of policy preferences to create a continuous measure of ideology along the "left-right" political spectrum for each county's mean citizen.

[44] We use the 2016 release of the county-level estimates.

Table 3.5: Alternative measures of political ideology.

	2016 presidential election		*American ideology project*	
	(1)	(2)	(3)	(4)
Post-activism	-0.004		-0.032	
	(0.012)		(0.004)	
Post-activism × Republican vote	-0.001			
	(0.000)			
Post-activism × Conservative ideology			-0.020	
			(0.012)	
Post-activism × Very liberal		-0.010		-0.008
		(0.013)		(0.013)
Post-activism × Liberal		-0.032		-0.032
		(0.005)		(0.006)
Post-activism × Conservative		-0.033		-0.037
		(0.005)		(0.005)
Post-activism × Very conservative		-0.054		-0.039
		(0.007)		(0.006)
Seasonality controls	Yes	Yes	Yes	Yes
Observations	1,941,795	1,941,795	1,939,140	1,939,140
R^2	0.96	0.96	0.96	0.96

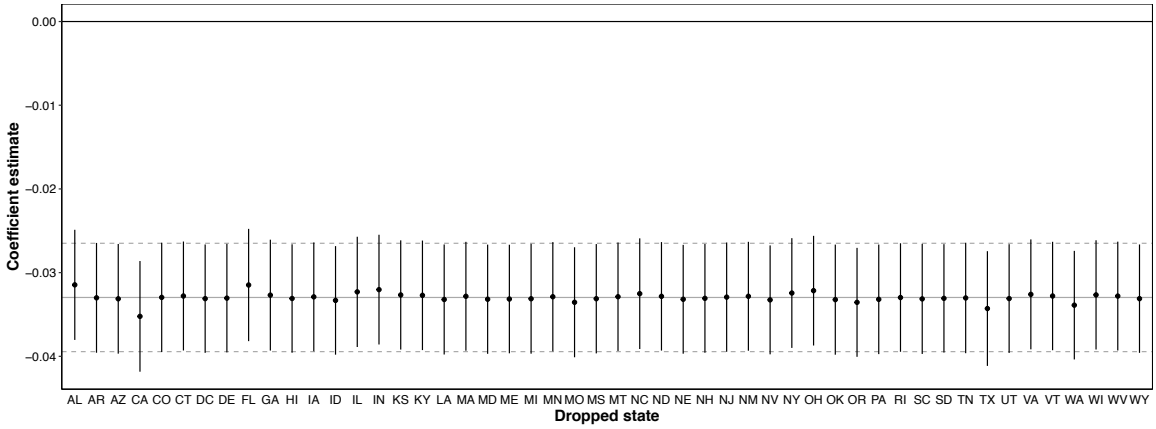
Note: All models include store and week-industry-county fixed effects. Republican vote is the percentage of total votes cast for the Republican presidential candidate in the 2016 general presidential election within the store's county. Conservative ideology is the left-right measure of county-level political ideology from the American Ideology Project; higher values correspond to a more conservative (i.e., politically right) ideology. Very Liberal, Liberal, Conservative, and Very Conservative are categorical variables based on Republican vote for Models 1–2 and based on Conservative ideology for Models 3–4. For Republican vote, the cutoffs for each category are [0, 30], (30, 50], (50, 70], and (70, 100], respectively. For Conservative ideology, the cutoffs for each category are (-inf, -0.3], (-0.3, 0], (0, 0.3], and (0.3, inf), respectively. Observations differ between Models 1–2 and 3–4 due to missing data. Standard errors in parentheses are clustered by store.

Table 3.5 re-creates the estimates from Columns 3–4 of Table 3.3 using the two alternative measures in place of the average Republican vote share variables. Like the main estimates, the estimates using the alternative measures suggest that CEO activism supporting gun control had a small, negative net effect on sales, with the largest effects in more politically conservative counties. Estimates based on Republican vote share in the 2016 presidential election (Columns 1–2) are nearly identical to those in Table 3.3 using the average of Republican vote shares across three elections. Estimates using the ideology measure (Columns 3–4) are generally smaller in magnitude but the most liberal areas continue to show no effect of activism while conservative areas see decreases in store visits of four percent (versus five percent using measures based on Republican vote share). Regardless of the measure we use, there is a

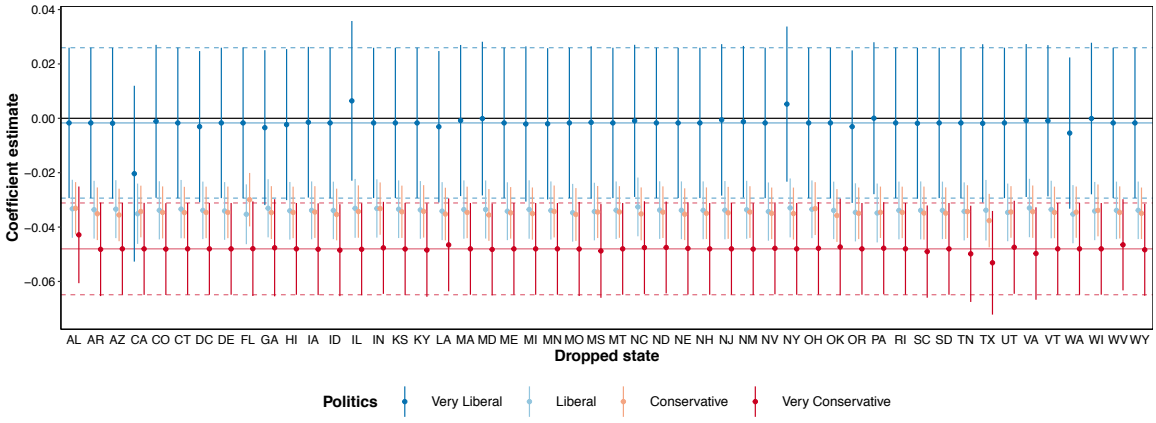
statistically significant difference between the effects in the most liberal and most conservative areas.

3.6.3 Omitting Individual States

We confirm that our results do not depend on any individual state by removing stores located in each state and re-estimating the models presented in Columns 2 and 4 of Table 3.3.



(a) Net effect of activism, dropping individual states



(b) Effects of activism by political affiliation, dropping individual states

Note: Horizontal lines show coefficient estimates using the full sample—those from Table 3.3—and dashed lines represent 95-percent confidence intervals. Lines for the *Liberal* and *Conservative* categories omitted from subfigure (b) to minimize clutter. Political categories are defined as in Table 3.3.

Figure 3.8. Effect of activism by dropping individual states

The results are presented in Figure 3.8, which shows that no single state drives estimates of the net effects. Similarly, estimates for the effects by county political affiliation are mostly stable across subsamples omitting each state and similar to estimates relying on the full sample of stores with the exception of models that omit California, which produce smaller coefficient estimates for the effects of activism in very liberal counties. California alone accounts for 30 percent of our observations in very liberal counties.

3.7 Discussion and Conclusions

We evaluate the effect of CEO activism on store-level performance and consumer polarization using the decision of several CEOs to call for stricter gun control following two mass shootings in 2019. Those CEOs' responses, which were widely covered in the popular press, provide an opportunity to examine the effect of CEO activism on store-level performance in a large, observational dataset. We examine three aspects of the relationship between CEO activism and performance: (a) the net effect of activism on sales, (b) potential asymmetry in the effects on consumers who agree versus disagree with the CEO, and (c) the persistence of the effects over time.

We find that CEO activism supporting stronger gun control resulted in a temporary and modest net decrease in store visits. The effects on supporters versus opponents of the CEOs' stance differ and are asymmetric; in aggregate, the behavior of consumers who agree with the CEOs does not change while consumers who disagree with the CEOs reduce visits to that company's stores. Specifically, stores serving conservative consumers—who are likely to disagree with the CEOs' position—experience a four to five percent decrease in visits.

These performance effects of CEO activism dissipate quickly. Net store visits decline three percent over the four weeks following activism, but quickly recover. We find no evidence of a persistent net effect or polarization effect on store visits over the 10-week post-activism period.

Our results are among the first, non-experimental measures of how CEO activism affects firm performance and of the relationship between consumer ideology and the response to activism. Affective polarization has greatly increased in the United States over the past several decades (Iyengar *et al.*, 2019; Boxell, Gentzkow & Shapiro, 2020) and consumers expect CEOs to speak out on controversial issues (Larcker *et al.*, 2018). Our study can inform managers' judgments about the likely costs and benefits of activism on controversial issues unrelated to their business.

Our study does, however, have limitations. One limitation of our study design, as of most difference-in-differences studies, is the difficulty of reliably estimating longer-term dynamic treatment effects. The persistence of consumer responses to activism is a key issue for strategy. CEO activism that has long-lived effects could be used to intentionally polarize a firm's consumers and thus differentiate its products ideologically in ways that would be hard for competitors to imitate. Our results suggest that one-off activism polarizes consumers only temporarily, with the caveat that our estimates of treatment effects several weeks removed from the activism may be biased by other events. Future research is therefore needed to establish how CEO activism affects consumers over the long term and whether would-be CEO activists must continuously engage in activism if it is to affect firm performance. Another possible limitation of our study is the assumption that foot traffic is a good proxy for sales. Although market research (Perdikaki, Kesavan & Swaminathan, 2012) supports this assumption, our estimates would be

biased if CEO activism resulted in fewer net visits, but much greater spending per visit. Mobile phone location data are often used by investors such as hedge funds to measure performance and by companies themselves for attributing sales to marketing efforts, which speaks to the reliability of store visits as a proxy for sales. We believe that the mobile phone location data used in this study are especially promising for research on CEO activism and other phenomena likely to have heterogenous treatment effects across a company's locations.

When discussing differentiation and low-cost strategies, the strategy literature has mainly focused on the market setting. More recently, there is interest in how firms can differentiate in non-market settings (Flammer, 2015), partly driven by the increasing difficulty of building and sustaining a unique market position (Oberholzer-Gee & Yao, 2018). Our study, by showing both net effects and polarization effects of CEO activism, highlights a potential pathway for firms to differentiate beyond the market. Such differentiation can uniquely position a firm among competitors by signaling its social values to stakeholders, who may then become more willing to purchase the firm's products or supply it with inputs. For such a strategy to succeed, this willingness must be persistent and the firm's non-market position must be difficult to imitate. As noted above, our results suggest that CEOs may need to engage in more than one-off activism to permanently change consumer behavior. One possibility in our context, however, is that the temporary, negative effect among consumers who oppose gun control was a "price" the CEOs paid for activism intended to benefit their employees or investors. Our data only allow us to examine the effect of activism on consumers, but future research should consider ways to measure several stakeholders' responses to activism events.

Future research should also address the feasibility of competitors imitating activist CEOs. Superficially, it seems trivial for any CEO to speak out on a controversial issue. We note several

(non-exhaustive) reasons, however, that this may not be the case. First, the expected costs and benefits of speaking out may depend on complementary assets, such as public relations capabilities or reputational resources that are difficult to imitate. Second, CEOs may find that taking a stance on an issue is inconsistent with other elements of the firm's strategy. For example, in the summer of 2020, several organizations ostensibly supporting Black Lives Matter were criticized for not taking concrete actions to oppose racism (Chintagunta, Kansal & Pachigolla, 2020; Jan *et al.*, 2020). Third, there may be first-mover advantages to activism. The media, for example, widely acknowledged Merck CEO Ken Frazier as the first CEO to resign from Donald Trump's business advisory council following the President's remarks regarding a protest by white nationalists in Charlottesville, VA. But while speaking out first may take particular courage, whether CEOs and companies are rewarded for this is an open question. CEOs increasingly face the difficult task of navigating contentious social issues such as gun control, abortion, LGBTQ rights, and police use-of-force regardless of whether the issue has anything to do with the company's products or services. The positions executives take can affect nearly all stakeholders, including consumers, employees, and investors. Our results indicate that CEO support for gun control following two mass shootings had small net effects on sales, but polarized consumers. Store visits declined in conservative counties, where consumers are least likely to agree with the CEOs' position, but were largely unchanged among consumers likely to support gun control. Even these effects, moreover, were temporary, suggesting that CEO activism on gun control may have had little long-term effect on firm performance even in politically conservative markets.

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