Is Private Equity Good for Consumers?*

Cesare Fracassi† Alessandro Previtero‡ Albert Sheen§

Abstract

We investigate the effects of private equity on consumers, using detailed price and sales data for an extensive number of consumer products. We find that manufacturing firms acquired by private equity raise prices marginally—less than 1%—on existing products relative to matched control firms. Overall industry price levels rise after buyouts, but again the price increase is very limited. More notably, target firm sales increase significantly due to greater new product introductions and availability within and across cities. These results are stronger for private firm targets that likely face greater capital constraints, and in industries where competitive pressure is higher Contrary to the common view that private equity leads to substantial price increases, this evidence suggests that consumers could benefit from private equity deals through an increase in product variety.

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†University of Texas at Austin, McCombs School of Business, 2110 Speedway, Stop B6600, Austin, TX 78712. Telephone: (512) 232-6843. E-mail: cesare.fracassi@mccombs.utexas.edu

‡Indiana University, Kelley School of Business, 1275 E. 10th St., Suite 6669, Bloomington, IN 47405. Telephone: (812) 856-3590. Email: aleprevi@indiana.edu

§University of Oregon, Lundquist School of Business, 377 Lillis , Eugene, OR 97403. Telephone: (541) 346-8057. Email: asheen@uoregon.edu

In 2014 the U.S. private equity firm Cerberus Capital Management acquired from Astra Zeneca the drug Dutoprol, a medication used in the treatment of high blood pressure. In the two years following the acquisition, the drug price increased tenfold. Private equity deals have become commonplace in the United States and have experienced a significant growth in Europe and Asia. Nonetheless, the public view of private equity is generally negative as the example of the drug Dutoprol well illustrates. Critics have raised serious concerns about private equity firms raising corporate profits at the expenses of other stakeholders, such as workers and consumers.

We investigate whether private equity deals harm consumers, using a retail scanner data for nearly 2 million unique products in over 1,100 consumer product categories. Compared to control firms, firms acquired by private equity raise prices marginally on existing products, between 0.4% and 0.6%. After buyouts, competitors also modestly increase prices. Thus overall, target firms increase prices in absolute terms by roughly 1% in the five years following the deal. Nonetheless, target firms substantially raise their sales by launching new products and expanding into new stores and geographical areas. Our results are stronger for private firm targets, suggesting that capital constraints could limit the economic growth of these firms. Taken together our evidence suggests that private equity deals could be beneficial for consumers by increasing product variety.

We obtain data on prices and units sold from the Nielsen Retail Scanner Data. In our sample period from 2006 to 2014, the Nielsen database covers more than 50% of the total sales of US grocery and drug stores and more than 30% of sales of US mass merchandisers. We merge this company-product sales information from Nielsen with data on private equity deals from Capital IQ. We find 145 firms targeted by private equity in our scanner data sample, of which 128 were private and 17 public. These firms sell

Our empirical strategy employs a stacked-cohort difference-in-differences methodology. We first match each private equity treated unit (i.e., firm, product category or product) with a control unit at the time of the private equity event. Each treatment-control pair represents a cohort. Cohort-level observations are stacked before we run a generalized difference-in-differences estimation. We then investigate the differential effect of private equity deals on prices, innovation and geographical availability of products.

First, compared to control firms, target firms significantly increase sales, units sold and the average price of their product lines. This price result can be driven by either higher prices on existing goods or shifting to a more expensive product mix. To better interpret these results, we analyze the changes in prices of existing products. Compared to products in the same category and the same store, a given product sold by target firms in a given store increases prices only marginally, by about 0.6% and does not sell more units. Competitors firms respond to private equity deals by increasing pricing but only in those instances when the competition is direct. Again their price increase is limited and equal to 0.4%. Hence, our estimate would suggest that the absolute price increase in the five years following the buyout is around 1%.

The results on prices of existing products suggest that the significant increase in firm-level sales and average price appear to be more consistent with private equity firms introducing more higher-price products and perhaps entering into new product categories and new stores. We therefore directly test for the effects of private equity on product innovation and availability across different stores and geographic areas. After the private equity acquisition, firms introduce new products at faster pace and discontinue existing products at a similar pace compared to matched control firms. Most of the new products belong to already existing categories, with no significant expansion into new product categories. After the private

equity deals, the firms significantly increase their presence in different stores, retail chains, zip codes, counties and states.

We conclude by investigating cross-sectional differences in the effect of private equity deals. We find stronger results in private-to-private compared to public-to-private deals. Prices, sales and product innovations increase only for private targets. While private target expand geographically, public target reduce their presence across markets. This evidence is consistent with private equity firms acquiring private targets to alleviate capital constraints and spur their growth (Boucly et al., 2011). It is also consistent with private equity firms targeting public firms to reduce over-investment in market share (Jensen, 1986). We also find stronger uncreases to unit sales, innovation, and product availability in less concentrated, more competitive product categories, consistent with competition providing strong incentives to improve product offerings.

This work contributes to the empirical literature on the effects of private equity on corporate performance and operational practices. Boucly et al. (2011) analyze data from 839 French private equity deals and find that target firms increases profitability, sales, debt issuance and capital expenditures compared to control firms. Bernstein and Sheen (forthcoming) study the operational changes in 101 restaurant chain buyouts and document improvements in sanitation and food-safety, reduction in workers per store and menu prices. Consistent with these previous studies, we find that target firms increase unit sold, innovate more and strengthen their distribution network by expanding across stores and geographic regions. These potential benefits at the corporate level do not appear to come at the expenses of consumers who face only a very modest increase in prices. These results nicely dovetail with evidence that private equity deals could be beneficial to stakeholders, by promoting a more efficient reallocation of the workforce (Davis et al., 2014) and reducing work-related

injuries (Cohn et al., 2016). Our evidence also complements Chevalier (1995), expanding the analyses to consumer good manufacturers, to store-level consumer product data and investigating additional benefits to consumers other than changes in price.

The rest of the paper is organized as follows. Section I describe the potential effects of private equity on consumers. Section II introduces our consumer scan data and the private equity deals sample. Section III illustrates the research design. Section IV discusses the effect of private equity deals on prices, product innovation and availability. Sections V analyzes the difference between private-to-private and private-to-public deals and other cross-sectional implications. Section VI concludes and discusses the implications of our findings.

I. The Effect of Private Equity on Consumers

The effect of private equity on prices is ambiguous. Agency conflicts and liquidity constraints suggest that private equity could increase prices. First, agency theory (e.g., Jensen, 1986) predicts that managers might overinvest in market share, by setting prices too low. Leveraged buyouts would impose discipline and limit this type of empire building and, hence, lead to higher prices. Chevalier and Scharfstein (1996) introduce a model where liquidity-constrained firms charge higher prices. Private equity firms could then lead to price growth by significantly increasing the target firm leverage. Contrary to these views, private equity firms could lower prices if they promote efficiency and productivity gains (Davis et al., 2014), strengthen firm bargaining power and improve managerial practices (Bloom et al., 2015).

Consumers prefer more variety in their product selection (Kahn and Lehmann, 1991, Lancaster, 1990). The effect of private equity on product innovation and availability across different markets is also unclear. Earlier studies document how capital expenditures and

R&D activity fall following leveraged buyouts (Kaplan, 1989; Long and Ravenscraft, 1993). As in the previous case, agency conflicts and liquidity needs could both account for these findings. According to this view, private equity firms could lead to a decrease in product variety and an exit from the less profitable markets.

More recent studies support an opposite view. They document that that buyouts are associated with more cited patents (Lerner et al., 2011) and more patents in general (Amess et al., 2015). In the same vein, Boucly et al. (2011) find that target firms increases sales, debt issuance and capital expenditures compared to control firms. Their results are much stronger for private targets, supporting the notion that private equity firms acquire private targets to alleviate their capital constraints and promote their growth. If buyouts grants easier access to capital and better know-how and business connections, this can foster product innovation and geographical expansion and thus increase product variety for consumers.

II. Data Description

The data in this analysis are constructed by combining information on Private Equity buyouts (CapitalIQ) and retail store scanner data (Nielsen). In this section, we describe these data and provide summary statistics.

A. Nielsen Retail Scanner Data

We use product market data from the Nielsen Retail Scanner database from the Kilts Center for Marketing. This database tracks all purchases made in the United States from January 2006 to December 2014 at over 41,000 stores from 91 U.S. retail chains. Almost all major chains are present in our data, but their identities are anonymized. The largest chain

in the sample has 9,273 stores. The database covers roughly 50% of total U.S. grocery and drug store sales and 30% of U.S. mass merchandiser sales. The stores are spread across the United States, covering 98% of all media Designated Market Areas (DMAs). Nielsen tracks weekly average prices and units sold at each store for over 1.7 million unique consumer products.

The Nielsen data identify products by name and Universal Product Code (UPC). These are very specific. For example, Table II lists all products available under the category "Canned Green Beans" in a specific grocery store in Austin, TX, in December 2007 . 17 different green products are sold in the store differing in brand (e.g. Del Monte, General Mills,...), type of green bean (e.g. fresh cut, organic, French style,...), and size (e.g.8oz, 14.5oz, 28oz). For each product, we know the average price, the units sold, and the total sales. Panel A of Table I present the product characteristics: On average, a product is sold in 589 stores and a store sells roughly 18,000 different products. Nielsen groups items into mutually exclusive product categories such as "Vegetables-Beans-Green-Canned," "Fabric Softeners-Liquid," or "Vacuum and Carpet Cleaner Appliance." Panel B of Table I shows the category characteristics: There are 1,123 different product categories with on average 20 products per category in each store. Table A2 in the online appendix lists the largest product categories in the dataset. These product categories are highly concentrated, with an average Herfindahl-Hirschman index of 0.55. For each of the over 41,000 stores, this data thus provides comprehensive coverage of the price and quantity of everything sold in most supermarkets.

The granularity of the data allows us to precisely define competitors, market structure, and plausible counterfactuals for all out analyses. We can also timely track when firms introduce new products, discontinue products, and expand existing products into new markets.

We aggregate the data at the monthly level to shrink the dataset to a more manageable size.[1] We then match each UPC to a specific firm. The UPC standard is overseen by the GS1 organization. Manufacturers can buy from GS1 the usage right to a UPC company prefix that corresponds to the first six to nine digits of the UPC codes of its products. Firms are required to disclose their name and address when buying a company prefix. Using the GS1 Data Hub, we are ale to match 82% of the UPCs in the data to to a GS1 company prefix. We map the unmatched UPCs to companies, assuming that UPCs in the same firm share the first eight digit. Panels C and D of Table I presents firm characteristics. We have roughly 48,000 firms. The average firm sells 12 products from three product categories in 1,445 stores to nine retail chains.

To protect the identity of retailers, Nielsen masks the UPCs of the private label (store) brands. These constitute about 12% of all products. Since we study the effects of private equity on manufacturers, we exclude private label products from our analyses.

Despite the granular level of details, there are two important pieces of data that we do not have. First, the observed prices are retail prices sold to consumers, which is the sum of the wholesale price, and the supermarket markup. The main objective of the paper is to study the effect of private equity on consumers, and thus the best measure to use is the retail price. However, we do not know if the effects found in the paper are due to changes in manufacturer prices or in markups. The bargaining power between manufacturers and supermarkets might be altered by the PE entry, but we unfortunately do not have a way to test this. Second, we have no information about the costs to manufacture the products, and thus we cannot draw any direct conclusions about the profitability, or optimality of firms'

[1] The Nielsen data record weekly sales from Sunday morning to Saturday night. If the beginning or the end of the month is not a Sunday, we assign a pro-rata of the weekly units sold and sales to each corresponding month.

decision before or after the private equity deal.

B. Private Equity data

We obtain data on private equity deals from Capital IQ. We select all "closed" or "cancelled" majority stake transactions classified as "Leveraged Buyout", "Management Buyout", "Secondary Buyouts" or "Going Private Transaction", or whose investment firm type is "PE/VC". We study only deals closed or cancelled between 2007 and 2013 as we require at least one year of product market data before and after each deal, and the Nielsen data cover the 2006-2014 period. We find 145 private equity deals after matching the name of target firms from Capital IQ with the name of firms in Nielsen/GS1. Of all these deals, 128 are buyouts of private firms, and 17 are buyouts of either public firms or subsidiaries of public firms.

Figure 1 shows the number of buyouts over time. Deals are more frequent during the private equity boom of the mid-2000s and less frequent during the financial crisis starting in 2008. Table III lists the private equity targets with the highest sales in our sample. These are not necessarily the targets with the greatest deal value, just those most represented in the consumer product categories that we analyze. Table A3 in the online appendix shows the most common Private Equity partners in our sample.

III. Empirical Methodology

A. Research Design

Our goal is to examine the impact of private equity buyouts on consumer welfare. Thus, broadly, we ask how a firm acquired by private equity behaves in the product market with

respect to pricing, innovation, and product availability. We explore this question at two levels of aggregation: what happens at the overall firm level, and what happens at the individual product level.

Private equity partners do not randomly choose companies . As shown in Table A1 in the online appendix, they are more likely to target product categories that are not heavily concentrated, firms that are small in size but with a national geographic presence, and products that are cheaper than the competitors. While a comprehensive study of the rationale and the characteristics of firms and products taken over by private equity is beyond the scope of this study, it is important to point out that the selection of targets is not random. It is thus imperative to adopt an identification strategy that controls for these observable trends. One of the advantages of our setting is that the granularity of the data allows us to closely match a treated unit with a very similar counterfactual.

While the matching strategy comes close to an ideal randomized control experiment, we acknowledge that this does not completely solve endogeneity problems. Two concerns could arise: (1) while we control for pre-trends on observable characteristics, there could be other unobserved characteristics that we do not match on that could explain difference in outcome after the event; (2) even if we matched on observable (and unobservable) pre-trends, a company could be targeted because its products could be expected to to do better than in the past, relative to a similar control firm. With regard to the first concern, we find that after the matching procedure, the characteristics of the treated and control sample are similar also on the observable variables that we do not match on. This can mitigate the concern related to unobservable pre-trend. With regard to the second concern, we point out that while firms might be chosen because of their different future prospects, it is unlikely that private equity partners target a specific product (e.g. Del Monte Fresh Cut Green Beans)

rather than a very similar other product (e.g. General Mills Fresh Cut Green Beans) because of their different future appeal. More likely, firms are targeted because of the potential to improve distribution, innovation, and pricing strategies, which are all dimensions studied in this paper.

B. Matching Procedure

We first identify firms and products taken over by a private equity firm. We then match each firm or product with a close competitor chosen based on observable characteristics at the time of the private equity deal. We define each resulting treated-control pair as a cohort and then stack all cohorts. Finally, we run a difference-in-difference regression specification on this stack of cohorts.

We match each of the 145 treated firms in our sample with an control firm by considering both the number and growth rate of products sold, and the number and growth rate of the average price of products sold at the time of the private equity deal. Specifically, we match with replacement each treated firm with the closest control group, using as distance metric the Abadie and Imbens (2006) distance where each dimension is weighted by its standard deviation. Both treated and control units must be in the sample for at least one year before and one year after the buyout event to limit the changes in composition around the event.

For greater granularity, we also perform analyses at the individual product level. For each product-store, e.g., Del Monte 14.5 oz. French Style Green Beans sold in a particular store in Austin, Texas, we select a matched product in that same store, in the same product category at the time of the private equity deal. Again, we choose the particular green bean item that has the most similar level and growth trajectory in both units sold and price. Our 145 treated firms sell over 30 thousand products in, on average, 200 stores. So this analysis

stacks almost 6 million product-store cohorts.

C. Econometric Specification

In our main empirical analysis, we employ a stacked cohort generalized difference-in-difference strategy. Essentially, we take the difference in outcome for each treated unit (firm or product) i after the private equity deal relative to before, and compare it with the difference in outcome of its matched control unit within the same cohort c.

$$y_{i,c,t} = \beta(d_{i,c} \times p_{t,c}) + \alpha_{i,c} + \delta_{t,c} + u_{i,c,t} \tag{1}$$

All regressions are estimated for a time period of 24 months before the event, to make sure we have enough periods to test the parallel pre-trend assumption, to 60 months afterwards, to make sure we cover the average duration of a private equity deal. The unit-cohort fixed effect $\alpha_{i,c}$ ensures that we compare the outcome within the same unit after vs before the private equity deal. The time-cohort fixed effect $\delta_{t,c}$ ensure that the treatment unit is compared only with the matched control at each point in time. $d_{i,c}$ is a dummy variable identifying treated units. $p_{t,c}$ is a dummy variable equal to one if the time period is after the Private Equity event. The coefficient β represents the diff-in-diff effect of the private equity deal on the outcome variable relative to a matched counterfactual. The standard errors are double-clustered at the firm and at the month level to adjusted for heteroskedasticity, and serial and cross-sectional correlations in the error term (Bertrand et al., 2004).

The high-frequency data allows us not only to determine if there is an overall effect of private equity on firms and consumers, but also to track the changes in outcome over time. This is important for two reasons: First, we can check for parallel pre-trend assumption, to ensure

that we are indeed setting treated firms and products against comparable counterfactuals. Any pre-trend could invalidate the interpretation of the diff-in-diff results. Second, we can learn how quickly private equity firms implement changes over time. While previous studies used for the most part annual frequency, our data is unique in that its monthly frequency allows us to study minutiously the speed of change in outcome over time. We thus estimate the equation below:

$$y_{i,c,t} = \sum_{k=-24}^{60} \beta_k (d_{i,c} \times \lambda_{t,k,c}) + \alpha_{i,c} + \delta_{t,c} + u_{i,c,t} \tag{2}$$

Where $\lambda_{t,k,c}$ is a dummy equal to one if time t is equal to k, and zero otherwise. Standard errors are clustered at the firm level to control for heteroskedasticity and serial correlation in the error term. Given the large number of fixed effects, all regressions in the paper are estimated using the fixed point iteration procedure implemented by Correia (2014).

IV. Results

Our goal in this paper is to see whether and how private equity takeovers impact dimensions consumers care about. We look first at pricing, then product innovation, and lastly product availability.

A. The Impact of Private Equity on Consumer Prices and Sales

A.1. Firm-Level Analysis

What happens to the pricing and sales of goods sold by firms acquired by private equity? We begin by looking at overall firm prices. We calculate the sales-weighted average price for

all products in our sample sold by each firm, each month. This is a very rough measure—it combines all categories, products, and stores into a single number and is thus subject to compositional changes. For smaller, single category firms, however, it captures well overall trends in pricing. Similarly, we calculate firmwide units sold and dollar sales numbers each month.

Each firm acquired by private equity is matched to an untreated firm as described in section III.B. Panel A of Table IV shows estimated coefficients of regressions of each firm's weighted average log price, units, and sales on After, a dummy variable that equals one for firm-month observations under private equity ownership. We find that the average product price of a firm taken over by private equity are 2.4% higher relative to a matched firm but only marginally statistically significant. Units sold and revenues relative to a matched firm increase dramatically, however, by 35% and 43%, respectively, over the years following the deal. This appears on the surface consistent with a positive demand shock for the private equity treated firm's goods. This is consistent with several papers (e.g. Boucly et al. (2011))

The power of our data is that we can see beyond broad firm aggregates. Thus our next step is to "peel the onion" to better understand the drivers behind changes to prices and sales. A multitude of explanations could be possible for the firm-level results. Specifically, average prices could increase not only if the product in the same store becomes more expensive, but also because the mix of products sold changes over time, by entering into new more expensive geographic markets (e.g. New York City), by selling to higher-end retail chains (e.g. Whole Foods), by entering new more expensive product categories, or by releasing high-quality new products within the same category (e.g adding an organic variety of the existing product). We thus break each firm down into firm-categories. This has a threefold effect: (1) it increases the quality of the match, (for example, rather than comparing the average

prices and sales between Del Monte and General Mills, now we compare the average price and sales of the green-bean products between the two companies); (2) it allows to control for changes in product mix due to firms entering into new categories; (3) it controls for possible heterogeneous effects due to the fact that each category might have different players, competitive dynamics, and trends. The 145 private equity treated firms in our sample range from operating in a single Nielsen-defined product category (e.g., Noosa Yoghurt, LLC only sells products in the "Yogurt-Refrigerated" category in our sample) up to 105 categories for a firm such as American Roland Food Corp. . For each treated firm-category, we select a match an untreated firm-category with similar number and growth of products, and price level and growth.

In Panel B of Table IV, column 1, we regress the log of average nationwide price for a firm in a particular category, each month, on the After variable. With the greater precision achieved by isolating pricing in detailed categories, we find that average prices of private equity firms increase by 2.7% relative to matched firms, statistically significant at 1%. Columns 2 and 3 regress the log of the number of units sold and revenues each month, respectively, on After and show significant increases as well. Units sold outpace matched firm units by 35%, and this translates to 44% higher revenue growth. This breakdown at the product category level mimics the firm-level results.

Figure 2 plots the trend in average log price and sales over time, together with a 90% confidence interval. The graphs show that there is no pre-trend in price or sales before the private equity event. This is further confirmation that we are comparing similar firms and firm-categories. After the event, there is a gradual increase in both prices and sales over the next 3-5 years. Changes do not happen instantaneously after the private equity deal. It takes time for firms to renegotiate prices, introduce new products, and expand geographically.

A.2. Product-Level Analysis

Even after comparing firms within the same product category, multiple explanations still exist for these results with different implications for consumers. A relative increase in average nationwide category-level prices could be achieved by simply raising prices on existing products. Alternatively, the composition of goods could be shifting towards more expensive upmarket varieties. An increase in units sold could be driven by increasing market share in a given store—suggesting quality improvements—or by expanding to more stores or adding more products to the category portfolio.

To peel the onion further, we analyze individual products. A product is uniquely identified by its UPC code. Our empirical strategy involves matching each treated product in each store with a competing untreated product in that same store and category. In other words, we use neighboring items on each supermarket shelf as a counterfactual. This allows us to tease apart changes to existing products from composition effects.

The unit of observation is a specific UPC in a specific store in a month. A cohort is defined as a treated-untreated pair of products within the same store-category. We regress the log of average price is regressed on After, and product-cohort fixed effect and cohort-time fixed effects. The sample size is over 825 million observations (68K Products x 70 months x 170 stores), and over 410 million fixed effects (5.7M Cohorts x 2 (treat/control) + 5.7M Cohort x 70 months), limiting our ability to run an OLS regression. We thus decided to run 100 regressions by dividing the sample into 100 sub-samples, similar to a block-bootstrapping procedure. Each sub-sample includes all stores with the same last 2 digits of the nielsen-assigned store identifier. Such store sub-sampling preserves the fixed effect structure of the regression, and makes the data small enough to enable us to estimate the OLS regression coefficients. The bootstrapping method allows us to estimate non-parametrically the effect

of private equity on prices, units, and sales. In Figure 3 we present histograms of the 100 sub-sample estimates of the After coefficient on prices (panel A), units (panel B), and sales (panel C).

We find a statistically significant but economically modest increase in the price post-PE for a given treated product relative to a competing product in the same store, with a magnitude of 0.6%. This is much lower than a treated firm's average category price increase of 2.7% shown in Table IV. This suggests that private equity firms might not be raising existing prices much, but rather adding new products that are more expensive, or expand in new geographical areas with a high cost of living. Looking at units sold and sales reveals a dramatically different result from that at the category level. The coefficient on After is essentially zero for units sold, and and increases only by 1% for sales. This means private equity firms do not increase the number of units sold of existing products within their current stores. How, then, do units and revenues increase after private equity buyouts at the broader category and firm levels by such a larger percentage? If a firm does not sell more of existing products in existing stores, it must either be developing new products, or selling existing products in more places. We explore these innovation and availability stories in the next section.

A.3. Competitor Response

All the results thus far show what happens to private equity treated goods relative to a matched competitor. For a complete picture on pricing, we would like to know what happens to absolute prices in industries with private equity entrants. It could be that private equity firms keep price constant, and competitors actually decrease prices in an attempt to run highly-leverage private equity firms out of business. Alternatively, the price effects could be

bigger than the modest ones we found, if competitors also increase prices.

To study the pricing response of competitors upon private equity entry, we compare the price of the same competitor product, in stores where the private equity product is also sold, relative to stores where the private equity product is not sold. For example, let's assume that Del Monte, a private equity takeover target, sells green beans in Austin, TX but not in Eugene, OR. We will then compare the price of a specific green bean product sold by General Mills, who was not taken over by a private equity company, in stores in Austin, relative to stores in Eugene. In this way, we test whether competitors respond to the private equity entry by raising or lowering prices. This setup is particularly useful because we focus on products who are not acquired by a Private Equity, but respond to its entry. One could argue that perhaps private equity chooses to enter industries that are about to change in price. But it is harder to believe that private equity chooses industries that are about to change in price in only those stores and geographies in which it sells.

Using the same-store treated-untreated product pairs of section III.B, we identify the untreated products. We then create new cohorts, where each cohort is made of the same untreated product, but where the treatment depends on whether the private equity product is also sold in that store or not. For example, we will consider all stores in which General Mills green beans are sold. We will treat as "treated" all green beans sold in stores where also Del Monte green beans are sold, and untreated the same green bean products, but sold in stores where Del Monte green beans are not sold.

Column 1 of Table V uses all stores in which the competitor's product is sold. Column 2 includes only stores within the same retail chain in which the private equity product is sold. Column 3 includes only stores from different retail chains from the one where the private equity product is sold. Column 4 includes only stores in the same georgaphic market

area where the private equity product is sold. Column 5 includes only stores from different geographic market areas relative to the one in which the private equity product is sold. After is a dummy variable which equals one for competitor products after the private equity deal, in stores where also the private equity product is sold. As with the same-store product analysis, we include product-cohort fixed effects, and time-cohort fixed effects.

The coefficients in all specifications are positive, and statistically significant. Thus private equity entry leads close competitors to raise prices in stores with a private equity competitor relative to its prices in stores without. The magnitude is small, however—, ranging from 0.24% to 0.46%. Figure 4 plots the price response over time. Interestingly, the change to pricing is immediate. This suggests the overall category response is an actual price increase to existing products as opposed to a gradual increase due to introduction of new, more expensive models.

B. The Impact of Private Equity on New Product Development

Consumers care about product selection and variety ((Kahn and Lehmann, 1991, Lancaster, 1990). Do private equity firms change the pace of new product introduction? Do they expand into new industries? Lerner et al. (2011) and Amess et al. (2015) find that after an LBO buyout, firms increase their patenting activity, and produce more influential patents, suggesting either a relaxation of financial constraint, or reduced agency problems/shortermism. . While patents capture the early stages of innovation, we can measure the actual outcome of such innovation, with the release of new products. .

We first answer these questions at the overall firm level. For each of the 145 acquired by private equity, we match it with a non-private equity firm with the closest number and growth in products, and level and growth in prices. The unit of analysis is a unique firm-

month. Table VI illustrate the effect of private equity on product innovation. The number of new products (column 1) is the log of the number of products a firm has at time t. New products is a dummy equal to one if at least a new product is introduced by the firm during that month. Discontinued Products is a dummy equal to one if an existing product is discontinued by the firm during that month. Finally the Number of Categories is the log of the number of product categories a firm sells products in at time t.

In Panel A of Table VI we compare the product innovation across firms. Column 1, shows that overall the firms run by private equity expand their selection of products offered (distinct UPCs) by 15% after their acquisition, relative to matched firms. This can be achieved by introducing new products, or discontinuing fewer products. Columns 2 and 3 show that this is done by introducing new products to the market, and keeping the same rate of product discontinuation as matched firms. Private equity firms are about 4% more likely to introduce a new product to the market during a month after the private equity event than before. Pulling back one level of aggregation, we examine whether targeted firms are more likely to expand into new product categories. In column 4, we look at the number of categories firms sell in, before and after being acquired by private equity. The coefficient on $After$ is slightly positive and not significant. This suggests the increase in product variety appears to happen within targeted firms' existing business lines.

To confirm this interpretation, we focus in panel B within a firm-category. Thus we match each treated firm with a similar untreated competitor within the same category and stack these cohorts. Within each category, private equity controlled firms increase their unique product portfolio by 5% relative to their pre-private equity ownership days. New products also increase at a faster rate, while discontinuations are unchanged. It is indeed the case that private equity firms innovate within existing categories at a faster rate. Figure 5 show that

product innovation happens gradually over the next few years following the private equity buyout.

Overall, with respect to product development, private equity firms boost the number of new products but maintain the same level of discontinuation, resulting in a greater variety of products sold. These firms remain focused; there is no evidence private equity firms increase diversification into new industries. Given that average prices go up for these private equity treated firms, it appears these new products are slightly higher priced. And since there are more products for sale, this partially explains why overall unit sales for treated firms grow despite no change to existing product growth at the store level.

C. The Impact of Private Equity on Product Availability

We noted in section IV.A.1 that firms targeted by private equity increase their units sold and revenues at a faster rate than competitors. The development of new products (section IV.B) helps drive this result. In addition, it is possible private equity helps facilitate geographic expansion. Such an increase in product availability would benefit consumers because of the increased variety of product choices.

We employ the firm-level sample in Table VII, panel A, and the firm-category level sample in panel B. After, once again, is a dummy variable indicating a firm or firm-category month which is under private equity control, and the sample includes all firms, treated or not. First, we ask whether private equity firms sell products to new stores. Column 1 shows that firms increase the number of stores in which they sell their products by 15% after they are acquired by a private equity, relative to a matched untreated firm. This can happen by selling to more stores within the same retail chain, or by expanding the distribution channel to new retail chains. Column 2 shows that indeed private equity firms increase the number of

retail chains by 11% after the private equity event. While this fact shows that private equity firms expand to new stores, it is unclear whether they expand only locally, or they reach out to new geographic markets. We use 4 measures of geographic expansion in increasing order of coarseness: number of 3-digit ZIP (log), number of counties (log), number of Designated Market Areas (log) and number of states (log). Columns 3 to 6 show that private equity firms expand to 11% new ZIP areas, 10% new counties, and 8% new DMAs and states. Figure 6 shows that this expansion occurs steadily over the years subsequent to the deal close date. This is consistent with private equity bringing either capital or expertise to their targets.

V. Cross-Sectional Analysis

Private equity firm acquisitions appear to result in slightly increased prices and higher unit sales, primarily through the aggressive introduction of new products sold in more locations. But do private equity firms employ a "one size fits all" approach to their targets? In this section we consider cross-sectional variation along two dimensions. Are public and private targets treated differently? How does the industry concentration environment impact strategy?

A. Public vs. Private Targets

Public and private firms may reside at different points in their life cycles, require different types of assistance, and face different challenges. Private firms are more often constrained financially, while public firms are more mature and perhaps subject to agency problems and overinvestment. We rerun our main results on price, unit sales, product innovation, and product availability separately on public and private PE firm targets. Of the 145 treated

firms, 128 are private targets and 17 are public targets.

Table VIII, panel A, revisits firm-level changes to average price, units sold, and revenues after private equity acquisition relative to a matched untreated firm. Recall that in the pooled sample (Table IV), post-PE prices increased slightly while units and revenues increased dramatically. This same results hold for private firms. Column 2 shows that the magnitude of price increase is 3.2%, higher than for all firms combined, but still not quite statistically significant. Units sold increases significantly by 41%, shown in column 4. For public firms, however, the results disappear. Directionally, average firm prices, units, and sales all fall instead of increase. Panel B sharpens the unit of analysis to the firm-category level and finds a similar divergence between public and private firms.

When we compare products within the same store, we find similar results. Panels (a) and (b) of Figure 7 shows that price of public targets do not change, while prices increase by on average by 1% for products of private targets. Similarly, the number of units sold and the total sales decrease after the private equity deal for public firms, and increase for private firms.

Table IX revisits the Table VI results on product innovation by private equity firms, here splitting the analysis between public and private targets. Table IX showed that after a private equity takeover the variety of products offered increases, primarily in the target's existing business lines. We again find this overall result masks differences between public and private firms. Table IX, panel A, shows in columns 1-4 that all the increase in products sold and new products introduced happens within private firms. The coefficients on After for public firms are essentially zero. Panel B, which drills down to the firm-category level, shows the same result. Within particular product categories, private firm targets expand their offerings, public firms do not. There is also divergence in the broad number of categories in

which these firms participate. Columns 5 and 6 of panel A show that private firms expand into new areas, while public firms actually exit industries after private equity takeover.

Table X splits the product availability results between public and private PE targets. The even numbered columns in both panels A and B show that private firms expand to more stores and geographies. Public firms, shown in columns 1, 3, and 5, however, contract relative to a matched firm. Within a category, public firms reduce store count significantly by 24% and the number of states in which they sell by 11

This divergence in results between public and private firms suggests the existence of both growth and agency motives for private equity deals. Younger, private firms require access to financing to expand their product line, while public firms may be overinvesting.

B. Category Concentration

How do industry competitive dynamics affect the product market strategies of private equity firms? For each of the 1,123 product categories, each month, we calculate the Hirfindahl-Hirschman Index (HHI) value. This is done by computing the nationwide revenue market share, squaring, and summing these shares, resulting in a value between zero and one. Lower HHI values suggest lower industry concentration and greater competitiveness.

In Table 11, panel A, we regress a firm's average category price, units sold, and revenues in a month relative to that of a matched competitor's on After and After interacted with Category HHI. The interaction terms are all negative and significant. Thus our baseline results of slightly higher prices combined with increased unit sales occur only in competitive industries. Panel B revisits the number of new products introduced and offered overall, and panel C looks at store and geographic expansion in the presence of competition. Again, the coefficients on the interaction of After and Category HHI are negative. The consumer benefits

of greater innovation and availability are stronger in more competitive product categories.

Competition thus appears to provide strong incentives for private equity firms to advance the attractiveness of their target's brands. That average prices increase more in the presence of competition might seem on the surface to be inconsistent with this conclusion. Recall, however, from the individual product (UPC)-level analysis that a given product's prices do not increase. Average prices seem to increase due to a composition effect from the introduction of new, more expensive choices.

VI. Conclusion

Private equity is widespread in developed economies. Nonetheless buyout deals often elicit very strong and negative reactions. A common view is that private equity firms try to increase corporate profitability by laying-off workers and increasing prices and, hence, hurting other stakeholders such as workers and consumers. Using data at the establishment level, Davis et al. (2014) find that the layoffs are largely offset by job creation at new or acquired establishments. Moreover, target firms achieve a significant increase in productivity by exiting less productive establishment and entering more productive ones.

In the same spirit, we investigate the overall effects of private equity on consumers, using prices and sale data for almost two million consumer products from over 40,000 stores. The use of detailed retail scan data has several advantages. First, we are able to study the evolution of pricing strategies, product innovation and geographic availability following a buyout. Second, we can more precisely identify counterfactuals in our empirical analyses. In our difference-in-differences estimations, we analyze as treated and control units not only firms, but also product categories and products sold within the same store. Third, the

geographical richness of the data allows to study the competitors' response by comparing, for example, price changes in the same product across stores where the target product are sold and stores where they are not. This empirical strategy could reasonably alleviate the concern that more general trends – and not the private equity deals – are driving competitors' response.

Contrary to the critics' view, we find that target firms raise price only marginally. Compared to products sold in the same store, target firms raise price by about 0.6%. Competitors respond to private equity deals by raising prices only in those stores where the competition happens. Again these price increases are of limited magnitude, equal to 0.4%. Considering that we study price dynamics in the five years following a buyout, an overall price increase of roughly 1% for target firms does not seem to justify the popular view that private equity firms harm consumers.

Despite the marginal increase in the price of existing products, target firms experience a significant increase in their overall sales. Compared to matched firms, target firms launch more often new products and expand more aggressively geographically, within and outside pre-buyout States. Taken altogether our results suggest that consumers could actually benefit from private equity deals through an increase in product variety.

How do private equity firms spur product innovation and geographical expansion? We find that our results are stronger for private targets that tend to be more financially constrained. Our results are consistent with recent studies that document how buyouts could lead to significant growth for target firms, especially if they are private. We hypothesize that private equity provide easier access to funds for target firms and, possibly, the managerial expertise and know-how to manage this growth.

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Table I. Summary Statistics

The table presents summary statistics for all variables and data used in the paper. Panel A shows an overview of the number of products, stores, firms, and private equity deals in the sample. Panel B shows the characteristics of the product categories in the sample. Panels C and D show the firm characteristics. Panel E and F show the product characteristics.

PANEL A: Overall Sample

	N.		N.
N. Products	1,723,277	N. Stores	41,309
Av. N. Stores per Product	589	N. Chains	91
N. Products per Store	18,122	N. 3-Digit ZIP	877
N. Firms	48,006	N. Counties	251
N. PE Deals	145	N. Designated Market Areas	206
N. Private Target Deals	128	N. States	49
N. Public Target Deals	17		

PANEL B - Product Category Characteristics

	Obs.	Mean	Median	S.D.
N. Categories	1,123	1,123.00	1,123.00	0.00
N. Products per Category	1,123	20.34	8.04	36.61
N. Stores per Category	1,123	28,818.09	35,228.00	12,421.83
N. Firms per Category-Store	2,521,421,642	5.78	3.00	7.08
Herfindal Index	2,521,421,642	0.53	0.48	0.33

PANEL C - Firm Characteristics

	Obs.	Mean	Median	S.D.
N. Products per Firm	2,884,321	11.76	3.00	71.92
N. Stores per Firm	2,884,321	1,445.34	66.00	4,372.24
N. Chains per Firm	2,884,321	9.33	3.00	15.59
N. Categories per Firm	2,884,321	3.12	1.00	12.88

PANEL D - Firm Characteristics by Treatment

	Control Group				Treated Group			
	Obs.	Mean	Median	S.D.	Obs.	Mean	Median	S.D.
N. Products per Firm	2,862,710	11.59	3.00	71.92	21,611	34.65	12.00	68.45
N. Stores per Firm	2,862,710	1,413.50	64.00	4,315.44	21,611	5,663.38	1,631.00	8,158.17
N. Chains per Firm	2,862,710	9.21	3.00	15.44	21,611	25.27	15.00	24.53
N. Categories per Firm	2,862,710	3.08	1.00	12.88	21,611	7.22	3.00	11.78

PANEL E - Product Characteristics

	Obs.	Mean	Median	S.D.
Price	825,259,176	3.90	2.89	4.48
Monthly Units Sold	825,259,176	11.32	2.00	42.02
Monthly Sales	825,259,176	23.68	6.00	110.67

PANEL F - Product Characteristics by Treatment

	Control Group				Treated Group			
	Obs.	Mean	Median	S.D.	Obs.	Mean	Median	S.D.
Price	372,205,267	3.93	2.99	4.27	453,053,909	3.87	2.79	4.65
Monthly Units Sold	372,205,267	11.62	2.00	42.07	453,053,909	11.07	2.00	41.99
Monthly Sales	372,205,267	24.67	6.65	117.78	453,053,909	22.86	5.71	104.46

Table II. Example of Product Category: Canned Green Beans

List of canned green bean products available in one specific grocery store in Austin, TX, for the month of December 2007.

UPC	Product Details	Firm Name	Size (Oz.)	Units Sold	Sales	Av. Price
2400016286	Cut Green Beans	Del Monte Foods Inc.	14.5	109.43	101.88	0.92
2400016287	Cut Green Beans (No Salt)	Del Monte Foods Inc.	14.5	86.14	81.68	0.92
2400016289	French Style Green Beans	Del Monte Foods Inc.	14.5	51.00	49.89	0.94
2400016293	Whole Green Beans	Del Monte Foods Inc.	14.5	37.29	39.15	1.05
2000011197	Cut Green Beans	General Mills, Inc.	14.5	30.43	30.12	0.99
2400001546	French Style Green Beans	Del Monte Foods Inc.	28.0	16.71	21.90	1.31
3470001219	Cut Italian Green Beans	Sager Creek Vegetable Co.	28.0	11.29	18.96	1.68
3470001211	Cut Italian Green Beans	Sager Creek Vegetable Co.	16.0	21.57	18.34	0.85
3470001211	Cut Italian Green Beans	Sager Creek Vegetable Co.	14.5	21.57	18.34	0.85
2400039364	Pickled Green Beans with Dill Flavor	Del Monte Foods Inc.	14.5	15.29	18.05	1.13
2000011196	French Style Green Beans	General Mills, Inc.	14.5	17.29	17.11	0.99
2400001830	Cut Green Beans	Del Monte Foods Inc.	28.0	5.57	7.30	1.31
2400016290	French Style Green Beans (No Salt)	Del Monte Foods Inc.	14.5	7.14	7.04	0.95
2400001393	Cut Green Beans	Del Monte Foods Inc.	8.0	8.14	5.94	0.73
2400000087	Cut Green Beans (No Salt)	Del Monte Foods Inc.	8.0	3.71	2.71	0.73
2400016292	French Style Green Beans with Onions	Del Monte Foods Inc.	14.5	1.00	1.05	1.05
2400039201	Organic Cut Green Beans	Del Monte Foods Inc.	14.5	0.29	0.49	1.73

Table III. List of Largest Private Equity Deals

The table shows the largest private equity deals in our sample sorted by the monthly sales amount of products present in the Nielsen dataset. The deal value is reported by Capital IQ, and it refers to the overall deal value, which might includes divisions and subsidiaries that do not sell to supermarkets.

Target Name	Deal Date	Monthly Sales ($)	Deal Value ($Mil)
Del Monte Foods Company	8-Mar-11	62,491,016	5,482
H.J. Heinz Company	7-Jun-13	23,802,596	28,686
Evenflo Company, Inc.	8-Feb-07	9,514,464	260
Bradshaw International, Inc.	16-Oct-08	8,985,112	N/A
Peet's Coffee and Tea, Inc.	29-Oct-12	7,129,416	1,010
Armored AutoGroup Inc.	5-Nov-10	5,028,079	755
The Topps Company, Inc.	12-Oct-07	4,695,386	385
Old Orchard Brands LLC.	2-May-07	4,376,053	N/A
Parfums De Coeur Ltd.	5-Sep-12	4,335,658	N/A
Hoffmaster Group, Inc.	15-Oct-07	3,508,556	171

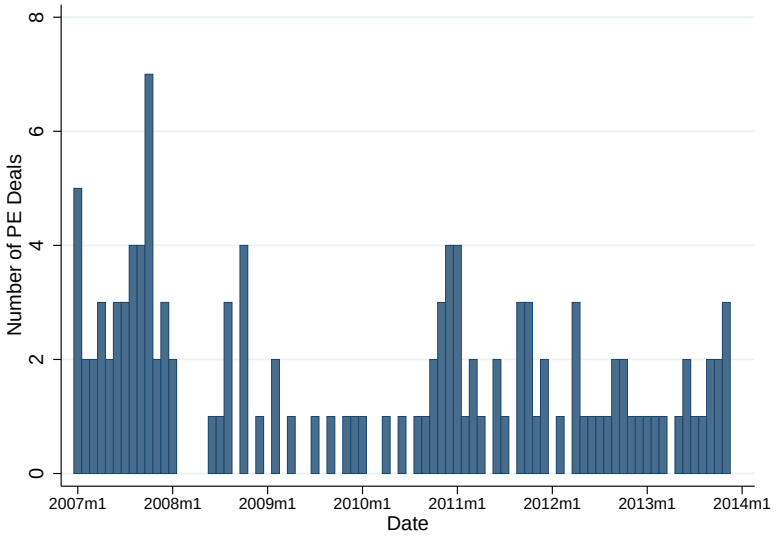


Figure 1. Trend of Private Equity Deals

The figure shows the number of private equity deals in our sample by month from January 2007 to December 2013.

Table IV. Private Equity and Pricing Strategy

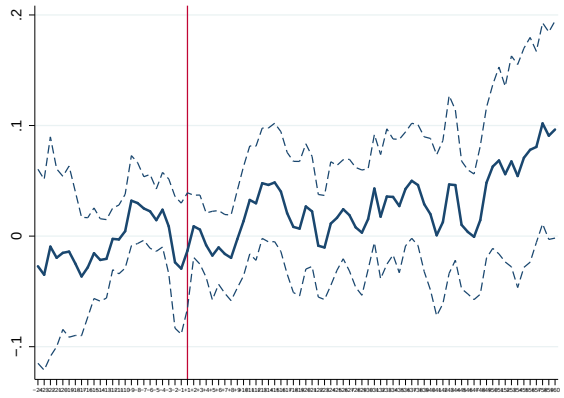
The table presents OLS coefficient estimates from regressing average monthly prices (column 1), units sold (column 2), and sales (column 3) on After, a dummy equal to one if the firm (Panel A) or firm-category (Panel B) underwent a private equity buyout in the past. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The unit of analysis is unique at the firm-month level in panel A, and at the firm-product category-month level in panel B. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Each cohort is a pair of treated-untreated firms (panel A) or firm-categories (panel B) where the treated unit is matched to the untreated unit with the closest distance at the time of the private equity deal in the level and growth in price, and number and growth in number of products using the Abadie and Imbens (2006) distance metric. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Within Firm

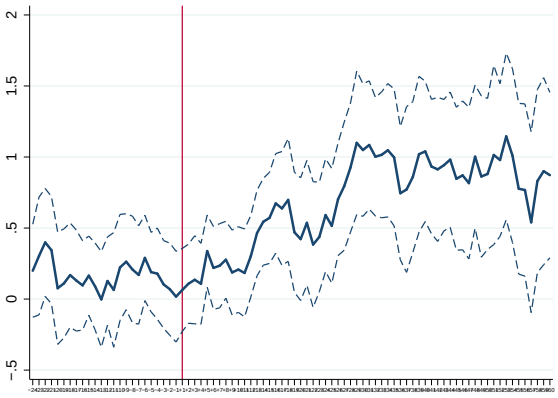
	Average Prices	Number of Units Sold	Sales
After	0.02441	0.35067***	0.42626***
	(1.36)	(2.89)	(3.26)
Adj. Within R-Square	0.001	0.009	0.011
N. Obs.	18,122	18,122	18,122
Firm-Cohort FE	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes

Panel B: Within Firm-Category

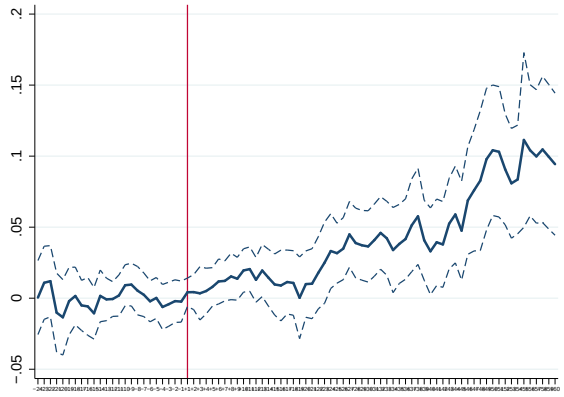
	Average Prices	Number of Units Sold	Sales
After	0.02744***	0.21052***	0.27421***
	(3.14)	(3.49)	(4.00)
Adj. Within R-Square	0.002	0.003	0.004
N. Obs.	122,822	122,822	122,822
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes



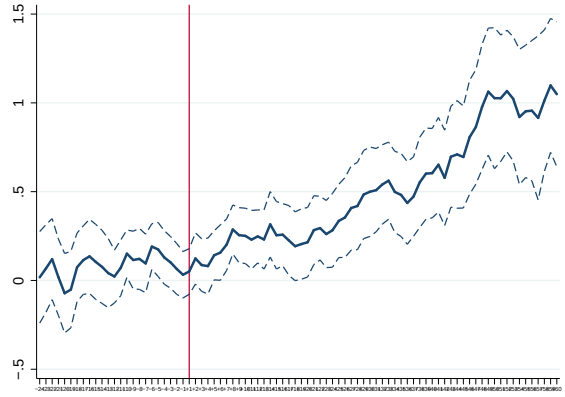
(a) Price - Within Firm



(b) Sales - Within Firm



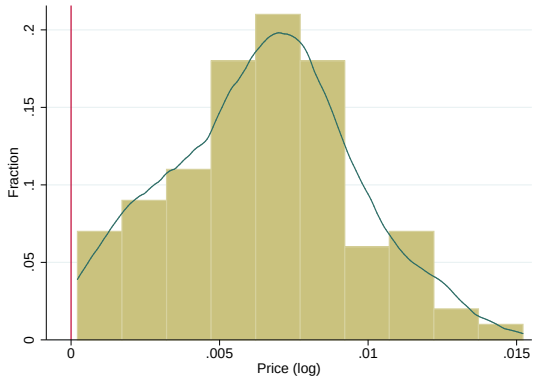
(c) Price - Within Firm-Category



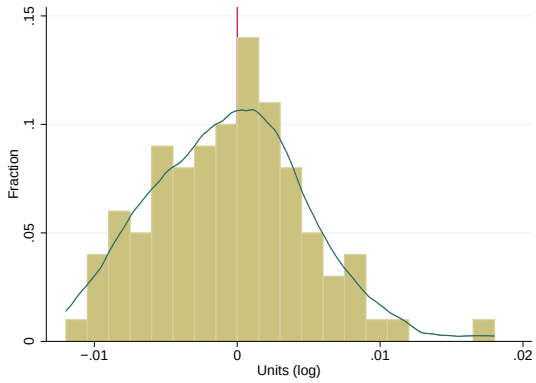
(d) Sales - Within Firm-Category

Figure 2. Trend over time of Average Price and Total Sales.

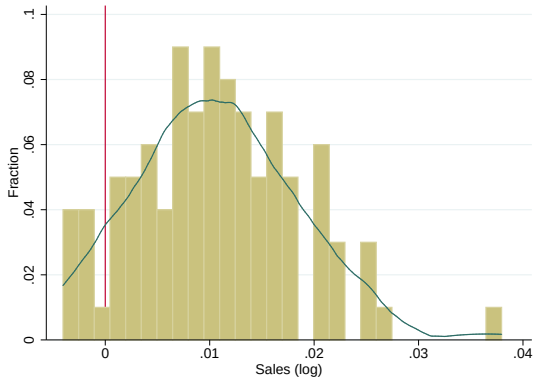
The figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are average price for panels (a) and (c) and total sales for panels (b) and (d). The unit of analysis is a firm-month for panels (a) and (b), and a firm-category-month for panels (c) and (d). The coefficient estimate at time t represents the outcome variable between private equity firms/firm-categories and matched non-private equity firms/firm categories t months away from the date of closing of the private equity deal. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal, indicated by the red line. The dotted lines show the 90% confidence interval.



(a) Price



(b) Units



(c) Sales

Figure 3. Same-store block-bootstrapping model - Histograms of coefficients

The figures show the histogram of the coefficient estimates of 100 block-boostrapped regressions of the effect of a private equity deal on prices (panel (a), units sold (panel (b)), and total sales (panel (c)) comparing PE-treated products with matched non-PE products within the same store and category. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal.

Table V. Pricing Response of Competitors

The table presents OLS coefficient estimates from regressing average monthly prices on After, a dummy equal to one if the the store-category had at least one product that underwent a private equity buyout in the past. The sample only includes products whose firms did not go through a private equity deal. Each cohort is made of a treated product that is sold in a store-category where a private equity deal occurred, and 10 matched control products with the same UPC, but sold in store-categories where a private equity deal has not occurred. Column 1 uses as control 10 products from stores randomly chosen across all stores in the US. Column 2 uses as control 10 products from stores randomly chosen within the same retail chain of the treated product. Column 3 uses as control 10 products from stores randomly chosen from different retail chains than the one of the treated product. Column 4 uses as control 10 products from stores randomly chosen within the same Designated Market Area of the treated product. Column 5 uses as control 10 products from stores randomly chosen from different Designated Market Area than than the one of the treated product. Regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	Full Sample	Same Chain	Different Chain	Same DMA	Different DMA
After	0.00439***	0.00328***	0.00401***	0.00242***	0.00467***
	(7.75)	(8.45)	(6.30)	(4.50)	(8.15)
Adj. Within R-Square	0.000	0.000	0.000	0.000	0.000
N. Obs.	4,263,718	3,609,492	3,783,650	3,303,096	4,147,872
Product-Cohort FE	Yes	Yes	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes	Yes	Yes

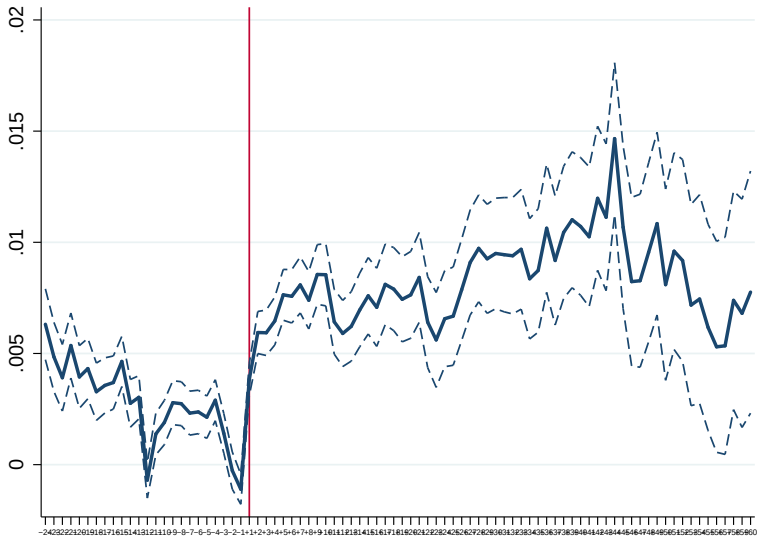


Figure 4. Trend in Price response of Competitors

The figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are product monthly price. The coefficient estimate at time t represents the outcome variable between treated products and matched control products t months away from the date of closing of the private equity deal. The sample only includes products whose firms did not go through a private equity deal. Each cohort is made of a treated product that is sold in a store-category where a private equity deal occurred, and 10 matched control products with the same UPC, but sold in store-categories across the US where a private equity deal has not occurred. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal, indicated by the red line. The dotted lines show the 90% confidence interval. Regressions are estimated using the fixed point iteration procedure implemented by Correia (2014).

Table VI. Private Equity and Product Innovation

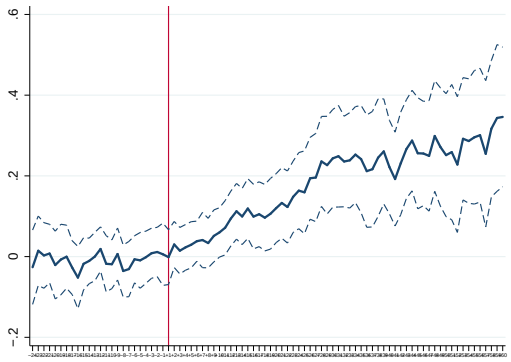
The table presents OLS coefficient estimates from regressing the number of products (column 1), new product dummy (column 2), discontinued product dummy (column 3), and number of product categories (column 4) on After, a dummy equal to one if the firm (Panel A) or firm-category (Panel B) underwent a private equity buyout in the past. The number of products is the number of products that a firm or firm-category has on the shelves in at least one store in that month. The new product dummy is equal to one if the firm or firm-category introduces at least one new product in that month. The discontinued product dummy is equal to one if the firm or firm-category discontinues at least one existing product in that month. Number of categories is the number of categories in which a firm has at least one product on the shelves in that month. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The unit of analysis is unique at the firm-month level in panel A, and at the firm-product category-month level in panel B. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Each cohort is a pair of treated-untreated firms (panel A) or firm-categories (panel B) where the treated unit is matched to the untreated unit with the closest distance at the time of the private equity deal in the level and growth in price, and number and growth in number of products using the Abadie and Imbens (2006) distance metric. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Within Firm

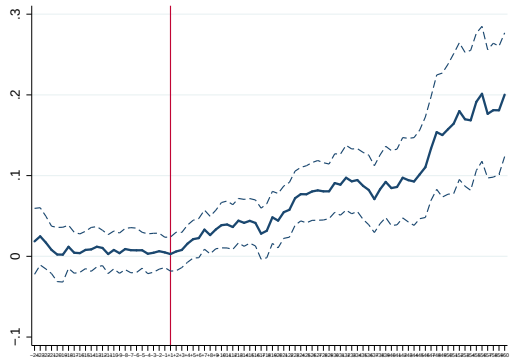
	Number of Products	New Products	Discont. Products	Number of Categories
After	0.15238***	0.03970***	-0.01130	0.02986
	(4.49)	(3.60)	(-0.79)	(1.26)
Adj. Within R-Square	0.024	0.001	0.000	0.002
N. Obs.	18,122	22,382	22,382	18,122
Firm-Cohort FE	Yes	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes	Yes

Panel B: Within Firm-Category

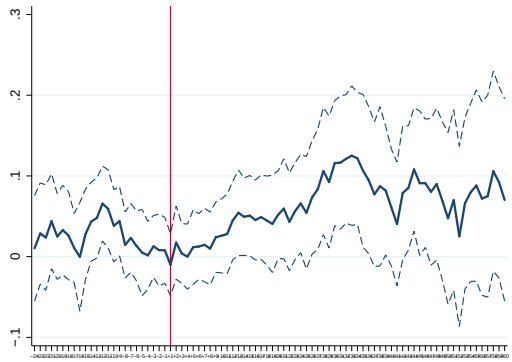
	Number of Products	New Products	Discont. Products
After	0.05162***	0.00844**	-0.00002
	(3.96)	(2.45)	(-0.01)
Adj. Within R-Square	0.004	0.000	-0.000
N. Obs.	122,822	135,960	135,960
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.Cohort FE	Yes	Yes	Yes



(a) Number of Products - Within Firm



(b) Number of Products - Within Firm-Category



(c) Number of Product Categories - Within Firm

Figure 5. Trend over time of Product Innovation

The figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are number of products for panels (a) and (b) and number of product categories for panel (c). The unit of analysis is a firm-month for panels (a) and (c), and a firm-category-month for panel (b). The coefficient estimate at time t represents the outcome variable between private equity firms/firm-categories and matched non-PE firms/firm categories t months away from the date of closing of the private equity deal. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal, indicated by the red line. The dotted lines show the 90% confidence interval.

Table VII. Private Equity and Product Availability

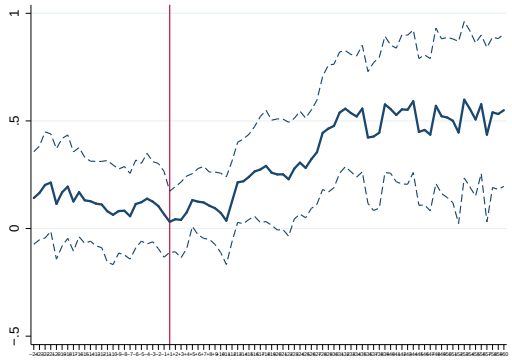
The table presents OLS coefficient estimates from regressing the number of stores (column 1), number of retail chains(column 2), number of 3-digit ZIPs (column 3), number of counties (column 4), number of Designated Market Areas (DMAs) (column 5), and number of states (column 6) in which a firm or firm-category sells its products on After, a dummy equal to one if the firm (Panel A) or firm-category (Panel B) underwent a private equity buyout in the past. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The unit of analysis is unique at the firm-month level in panel A, and at the firm-product category-month level in panel B. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Each cohort is a pair of treated-untreated firms (panel A) or firm-categories (panel B) where the treated unit is matched to the untreated unit with the closest distance at the time of the private equity deal in the level and growth in price, and number and growth in number of products using the Abadie and Imbens (2006) distance metric. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A. Within Firm

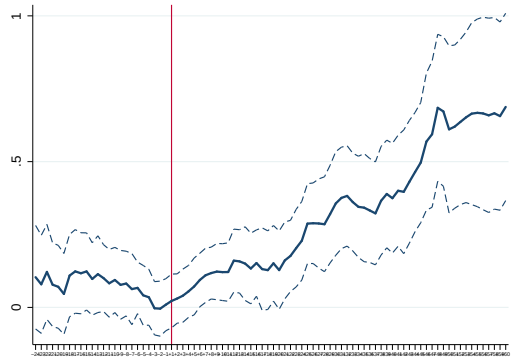
	N. Stores	N. Chains	ZIPs	Counties	DMAs	States
After	0.17992**	0.10543***	0.11099*	0.10865**	0.06803	0.06861*
	(2.15)	(3.02)	(1.76)	(2.05)	(1.29)	(1.72)
Adj. Within R-Square	0.006	0.012	0.004	0.005	0.002	0.004
N. Obs.	18,122	18,122	18,122	18,122	18,122	18,122
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Within Firm-Category

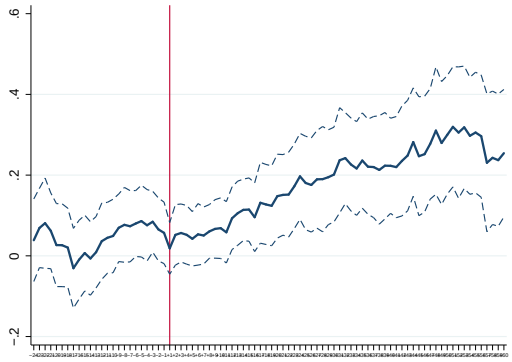
	N. Stores	N. Chains	ZIPs	Counties	DMAs	States
After	0.15719***	0.05761***	0.12099***	0.08462***	0.05827*	0.06299***
	(2.88)	(2.76)	(3.09)	(2.69)	(1.94)	(2.70)
Adj. Within R-Square						
N. Obs.	122,822	122,822	122,822	122,822	122,822	122,822
Firm-Category-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Category-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes



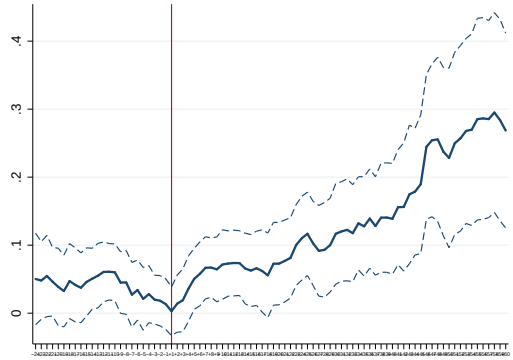
(a) N. of Stores - Within Firm



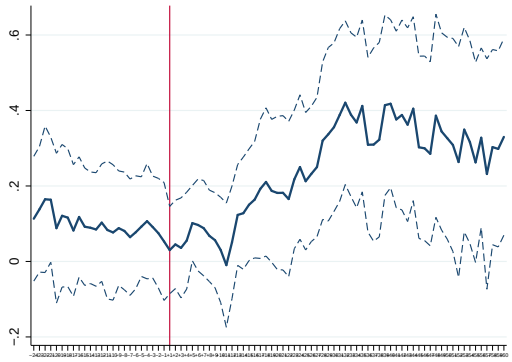
(b) N. of Stores - Within Firm-Category



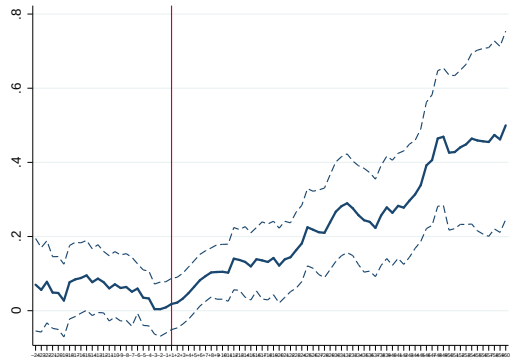
(c) N. of Retail Chains - Within Firm



(d) N. of Retail Chains - Within Firm-Category



(e) N. of 3-digit ZIPs - Within Firm



(f) N. of 3-digit ZIPs - Within Firm-Category

Figure 6. Trend over time of Product Availability.

The figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are number of stores for panels (a) and (b), the number of retail chains for panel (c) and (d), and the number of 3-digit ZIPs for panel (e) and (f). The unit of analysis is a firm-month for panels (a),(c), and (e), and a firm-category-month for panels (b), (d), and (f). The coefficient estimate at time t represents the outcome variable between PE firms/firm-categories and matched non-PE firms/firm categories t months away from the date of closing of the private equity deal. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal, indicated by the red line. The dotted lines show the 90% confidence interval.

Table VIII. Public Vs Private Target: Pricing Strategy

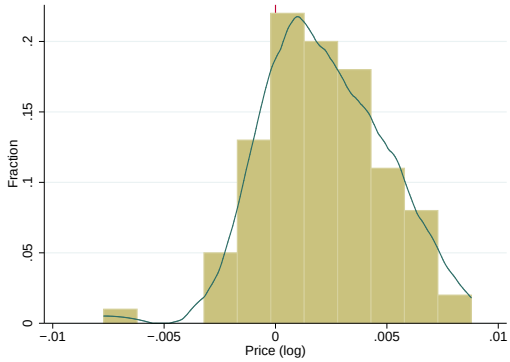
The table presents OLS coefficient estimates from regressing average monthly prices (column 1 and 2), units sold (column 3 and 4), and sales (column 5 and 6) on After, a dummy equal to one if the firm (Panel A) or firm-category (Panel B) underwent a private equity buyout in the past. The odd columns include only deals where the target was either a public company or a subsidiary of a public company before the private equity acquisition. The even columns include only deals where the target was a private company before the private equity acquisition. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The unit of analysis is unique at the firm-month level in panel A, and at the firm-product category-month level in panel B. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Each cohort is a pair of treated-untreated firms (panel A) or firm-categories (panel B) where the treated unit is matched to the untreated unit with the closest distance at the time of the private equity deal in the level and growth in price, and number and growth in number of products using the Abadie and Imbens (2006) distance metric. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Within Firm

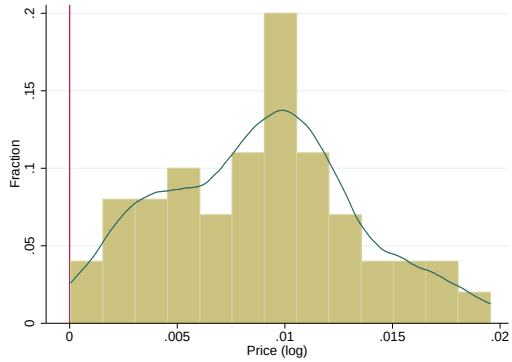
	Average Prices		Units Sold		Sales	
	Public	Private	Public	Private	Public	Private
After	-0.02992	0.03173	-0.10481	0.41201***	-0.18695	0.50885***
	(-0.79)	(1.63)	(-0.29)	(3.20)	(-0.47)	(3.67)
Adj. Within R-Square	0.006	0.002	-0.000	0.012	0.001	0.016
N. Obs.	2,026	16,096	2,026	16,096	2,026	16,096
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Within Firm-Category

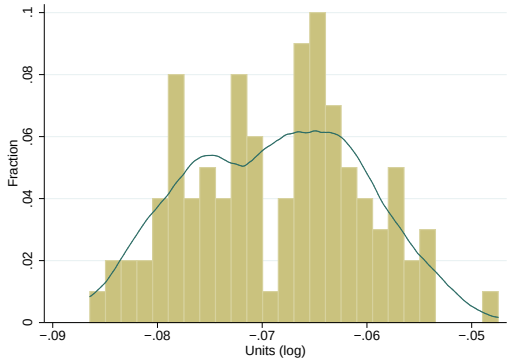
	Average Prices		Units Sold		Sales	
	Public	Private	Public	Private	Public	Private
After	-0.01526	0.03990***	-0.18095	0.32472***	-0.20217	0.41318***
	(-0.97)	(4.20)	(-1.48)	(5.14)	(-1.43)	(5.83)
Adj. Within R-Square	0.001	0.004	0.003	0.008	0.003	0.010
N. Obs.	27,122	95,700	27,122	95,700	27,122	95,700
Firm-Cat.-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes



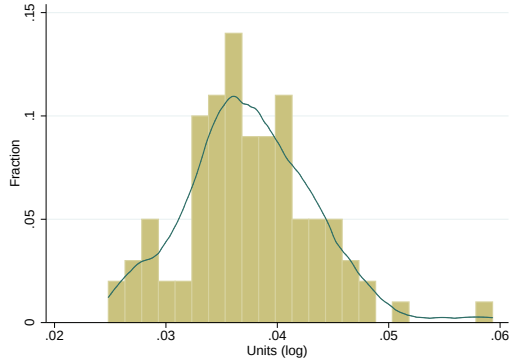
(a) Price - Public Target



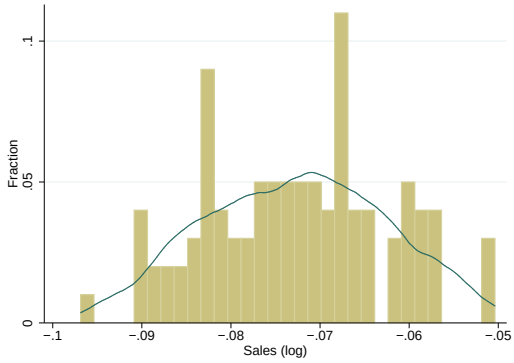
(b) Price - Private Target



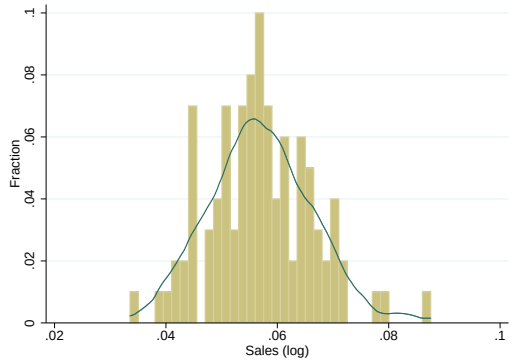
(c) Units Sold - Public Target



(d) Units Sold - Private Target



(e) Sales - Public Target



(f) Sales - Private Target

Figure 7. Same-store block-bootstrapping model - Histograms of coefficients - By Deal Type

The figures show the histogram of the coefficient estimates of 100 block-boostrapped regressions of the effect of a private equity deal on prices (panels (a) and (b), units sold (panels (c) and (d)), and total sales (panels (e) and (f)) comparing PE-treated products with matched non-PE products within the same store and category. Panels (a), (c), and (e) include only deals where the target was either a public company or a subsidiary of a public company before the private equity acquisition. Panels (b), (d), and (f) include only deals where the target was a private company before the private equity acquisition. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal.

Table IX. Public Vs Private Target: Product Innovation

The table presents OLS coefficient estimates from regressing the number of products (columns 1 and 2), new product dummy (columns 3 and 4), discontinued product dummy (columns 5 and 6), and number of product categories (columns 7 and 8) on After, a dummy equal to one if the firm (Panel A) or firm-category (Panel B) underwent a private equity buyout in the past. The number of products is the number of products that a firm or firm-category has on the shelves in at least one store in that month. The new product dummy is equal to one if the firm or firm-category introduces at least one new product in that month. The discontinued product dummy is equal to one if the firm or firm-category discontinues at least one existing product in that month. Number of categories is the number of categories in which a firm has at least one product on the shelves in that month. The odd columns include only deals where the target was either a public company or a subsidiary of a public company before the private equity acquisition. The even columns include only deals where the target was a private company before the private equity acquisition. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The unit of analysis is unique at the firm-month level in panel A, and at the firm-product category-month level in panel B. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Each cohort is a pair of treated-untreated firms (panel A) or firm-categories (panel B) where the treated unit is matched to the untreated unit with the closest distance at the time of the private equity deal in the level and growth in price, and number and growth in number of products using the Abadie and Imbens (2006) distance metric. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Within Firm

	N. of Products		New Products		Discontinued Products		Number of Categories	
	Public	Private	Public	Private	Public	Private	Public	Private
After	0.01618	0.17073***	-0.00447	0.05422***	-0.08687*	0.00453	-0.14087**	0.05286**
	(0.15)	(4.79)	(-0.13)	(4.00)	(-1.86)	(0.26)	(-2.14)	(2.09)
Adj. Within R-Square	-0.001	0.030	-0.001	0.003	0.005	-0.000	0.042	0.006
N. Obs.	2,026	16,096	2,066	15,790	2,066	15,790	2,026	16,096
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Within Firm-Category

	N. of Products		New Products		Discontinued Products	
	Public	Private	Public	Private	Public	Private
After	-0.02716	0.07460***	-0.00129	0.01154**	0.00760	-0.00243
	(-1.12)	(5.27)	(-0.24)	(2.52)	(1.20)	(-0.50)
Adj. Within R-Square	0.002	0.008	-0.000	0.000	0.000	-0.000
N. Obs.	27,122	95,700	26,346	91,830	26,346	91,830
Firm-Cat.-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Table X. Public Vs Private Target: Product Availability

The table presents OLS coefficient estimates from regressing the number of stores (columns 1 and 3), number of 3-digit ZIPs (column 3 and 4), and number of states (columns 5 and 6) in which a firm or firm-category sells its products on After, a dummy equal to one if the firm (Panel A) or firm-category (Panel B) underwent a private equity buyout in the past. The odd columns include only deals where the target was either a public company or a subsidiary of a public company before the private equity acquisition. The even columns include only deals where the target was a private company before the private equity acquisition. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The unit of analysis is unique at the firm-month level in panel A, and at the firm-product category-month level in panel B. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Each cohort is a pair of treated-untreated firms (panel A) or firm-categories (panel B) where the treated unit is matched to the untreated unit with the closest distance at the time of the private equity deal in the level and growth in price, and number and growth in number of products using the Abadie and Imbens (2006) distance metric. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Within Firm

	N. Stores		N. ZIPs		N. States	
	Public	Private	Public	Private	Public	Private
After	-0.48201**	0.26908***	-0.37713**	0.17674***	-0.19872***	0.10461**
	(-2.22)	(3.04)	(-2.63)	(2.62)	(-2.74)	(2.42)
Adj. Within R-Square	0.051	0.013	0.060	0.010	0.049	0.008
N. Obs.	2,026	16,096	2,026	16,096	2,026	16,096
Firm-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Within Firm-Category

	N. Stores		N. ZIPs		N. States	
	Public	Private	Public	Private	Public	Private
After	-0.24099**	0.27335***	-0.18548***	0.21039***	-0.11426***	0.11470***
	(-2.40)	(4.63)	(-2.96)	(4.89)	(-3.65)	(4.36)
Adj. Within R-Square	0.010	0.010	0.011	0.010	0.011	0.007
N. Obs.	27,122	95,700	27,122	95,700	27,122	95,700
Firm-Cat.-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Table XI. Cross-Sectional Tests By Category Concentration

The table presents OLS coefficient estimates from regressing average monthly prices, units sold, and total sales in panel A, number of products, new product dummy, and discontinued product dummy in panel B, and number of stores, 3-digit ZIPs and states in panel C, on After, a dummy equal to one if the firm-category underwent a private equity buyout in the past. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). The unit of analysis is unique at the firm-product category-month level. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. Each cohort is a pair of treated-untreated firm-categories where the treated unit is matched to the untreated unit with the closest distance at the time of the private equity deal in the level and growth in price, and number and growth in number of products using the Abadie and Imbens (2006) distance metric. Category HHI is the Herfindahl-Hirschman Index of the product category. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Pricing Strategy - Within Firm-Category

	Average Prices	Number of Units Sold	Sales
After	0.04148***	0.34756***	0.43979***
	(3.20)	(3.87)	(4.36)
After * Category HHI	-0.07174*	-0.70044**	-0.84635**
	(-1.79)	(-2.17)	(-2.42)
Adj. Within R-Square	0.002	0.004	0.005
N. Obs.	122,822	122,822	122,822
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes

Panel B: Product Innovation - Within Firm-Category

	Number of Products	New Products	Discont. Products
After	0.10659***	0.01603***	-0.00091
	(5.05)	(3.07)	(-0.14)
After * Category HHI	-0.28097***	-0.03896**	0.00456
	(-3.86)	(-2.32)	(0.20)
Adj. Within R-Square	0.007	0.000	-0.000
N. Obs.	122,822	135,960	135,960
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.Cohort FE	Yes	Yes	Yes

Panel C: Product Availability - Within Firm-Category

	N. Stores	ZIPs	States
After	0.32953***	0.26899***	0.17180***
	(4.25)	(4.72)	(4.96)
After * Category HHI	-0.88091***	-0.75651***	-0.55615***
	(-3.15)	(-3.73)	(-4.39)
Adj. Within R-Square	0.006	0.006	0.006
N. Obs.	122,822	122,822	122,822
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes

Online Appendix

Table A1. Private Equity Deal Selection

The table presents OLS coefficient estimates from regressing an industry dummy (column 1), a firm selection dummy (column 2), and a product selection dummy (column 3) on explanatory variables to determine the private equity interest in a specific product category, firm, or product. The sample is restricted to months in which a private equity event occurred. Industry selection dummy is equal to one if there was a private equity deal in that category in that month. Firm selection dummy is equal to one if the firm was acquired by a private equity company in that month. Product selection dummy is equal to one if the product is acquired by a private equity company in that month. The unit of analysis is unique at the industry-month for column 1, firm-month for column 2, and product-month for column 3. Standard errors are double-clustered at the firm and time. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	Industry Selection (1)	Firm Selection (2)	Product Selection (3)
Herfindal Index	-0.01760***		
	(-8.41)		
Price Av. (log)	-0.00164***	0.00030	-0.00043***
	(-3.52)	(0.97)	(-12.53)
Sales (log)	0.00100***	-0.00049***	-0.00028***
	(6.16)	(-3.40)	(-14.90)
Growth N. Products	0.00750**	-0.00030	
	(2.41)	(-0.86)	
Growth Sales	-0.00283*	0.00002	-0.00001**
	(-1.95)	(1.12)	(-2.30)
Growth Price Av.	0.00333	0.00022	0.00066***
	(0.96)	(0.74)	(9.16)
N. Stores (log)		0.00152***	0.00068***
		(5.22)	(28.64)
Growth N. Stores		-0.00009**	0.00000
		(-2.28)	(0.20)
Adj. With-in R-Square	0.003	0.002	0.000
N. Obs.	93,790	254,145	3,435,290
Year-Month FE	Yes	No	No
Industry-Year-Month FE	No	Yes	Yes

Table A2. List of Largest Product Categories

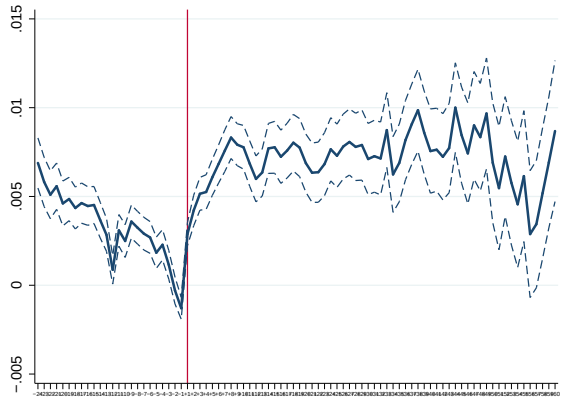
The table shows the largest product categories by monthly sales in the Nielsen dataset, together with the average number of products in that category nationwide.

Product Category	Monthly Sales ($)	Av. N. of Products
SOFT DRINKS - CARBONATED	464,483,456	2,336
CIGARETTES	436,368,864	1,004
DAIRY-MILK-REFRIGERATED	365,114,528	1,381
CEREAL - READY TO EAT	281,352,768	714
BAKERY - BREAD - FRESH	281,182,592	2,950
SOFT DRINKS - LOW CALORIE	276,506,880	944
WATER-BOTTLED	248,275,056	1,505
TOILET TISSUE	239,222,496	209
WINE-DOMESTIC DRY TABLE	236,378,656	5,458
LIGHT BEER (LOW CALORIE/ALCOHOL)	212,954,192	301

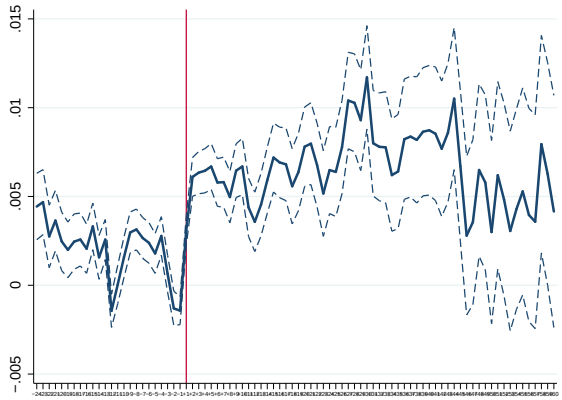
Table A3. List of Most Common Private Equity Partners

The table shows the most frequent private equity partners that are involved in the 145 private equity deals in our sample.

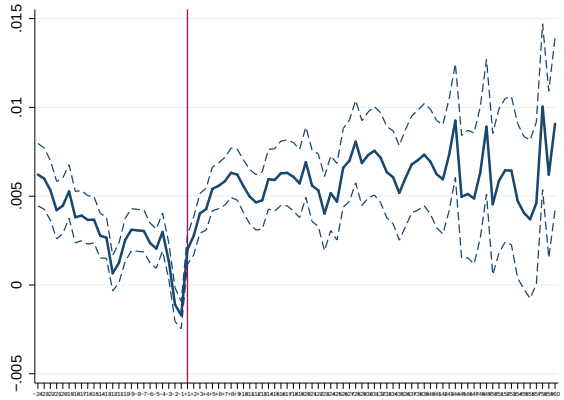
General Partner Name	N. of Deals
Sun Capital Partners, Inc.	5
Arbor Private Investment Company	4
Mason Wells	4
Wholesome Holdings Group, LLC	3
Brazos Private Equity Partners, LLC	3
Encore Consumer Capital	3
Linsalata Capital Partners	3
MidOcean Partners	3



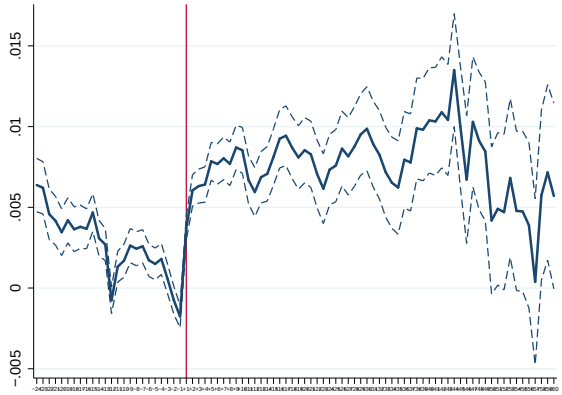
(a) Same Retail Chain



(b) Different Retail Chain



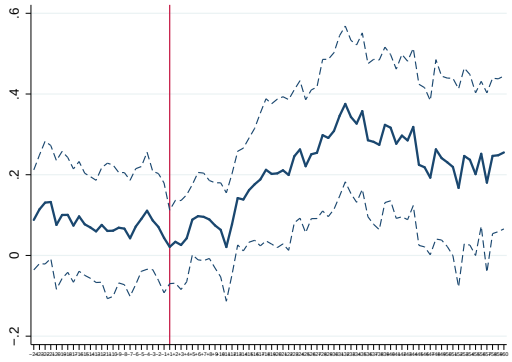
(c) Same Designated Market Area



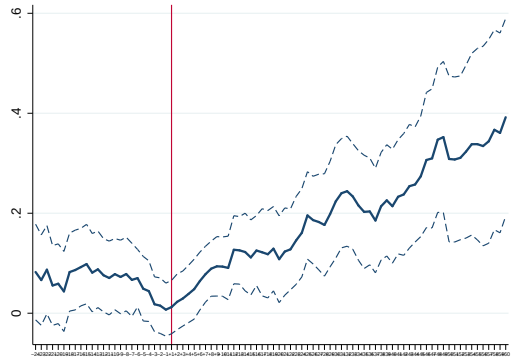
(d) Different Designated Market Area

Figure A1. Price Response of Competitors - By Control Type

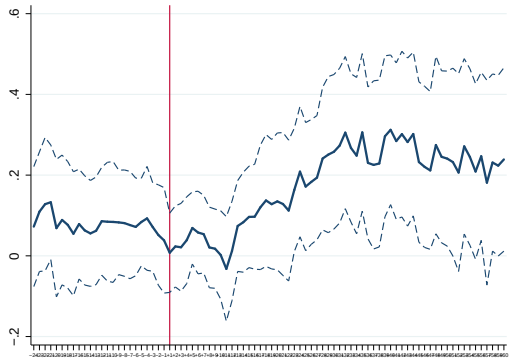
The figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are product monthly price. The coefficient estimate at time t represents the outcome variable between treated products and matched control products t months away from the date of closing of the private equity deal. The sample only includes products whose firms did not go through a private equity deal. Each cohort is made of a treated product that is sold in a store-category where a private equity deal occurred, and 10 matched control products with the same UPC, but sold in store-categories across the US where a private equity deal has not occurred. Panel (a) uses as control 10 products from stores randomly chosen within the same retail chain of the treated product. Panel (b) uses as control 10 products from stores randomly chosen from different retail chains than the one of the treated product. Panel (c) uses as control 10 products from stores randomly chosen within the same Designated Market Area of the treated product. Panel (d) uses as control 10 products from stores randomly chosen from different Designated Market Area than than the one of the treated product. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal, indicated by the red line. The dotted lines show the 90% confidence interval. Regressions are estimated using the fixed point iteration procedure implemented by Correia (2014).



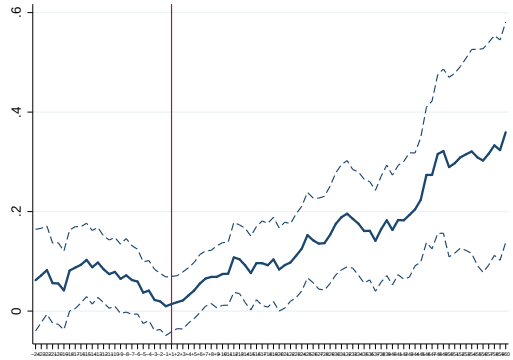
(a) N. of Counties - Within Firm



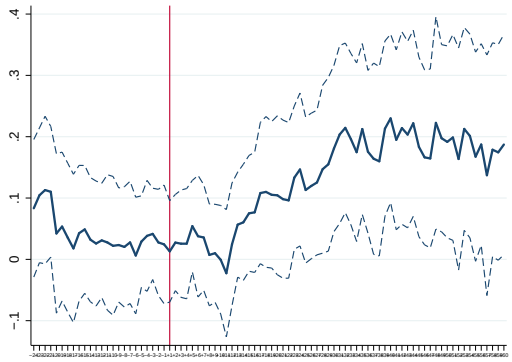
(b) N. of Counties - Within Firm-Category



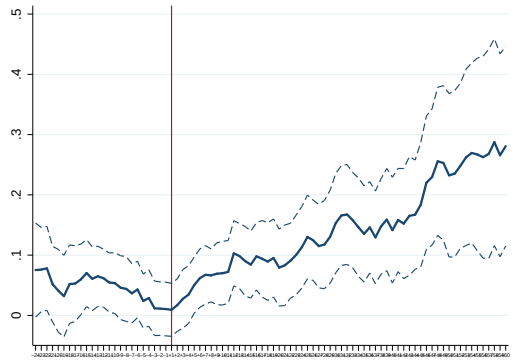
(c) N. of Market Areas - Within Firm



(d) N. of Market Areas - Within Firm-Category



(e) N. of States - Within Firm



(f) N. of States - Within Firm-Category

Figure A2. Trend over time of Product Availability.

The figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are number of counties for panels (a) and (b), the number of designated market areas for panel (c) and (d), and the number of states for panel (e) and (f). The unit of analysis is a firm-month for panels (a),(c), and (e), and a firm-category-month for panels (b), (d), and (f). The coefficient estimate at time t represents the outcome variable between PE firms/firm-categories and matched non-PE firms/firm categories t months away from the date of closing of the private equity deal. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal, indicated by the red line. The dotted lines show the 90% confidence interval.