Barbarians at the Store?
Private Equity, Products, and Consumers*

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Abstract

We investigate the effects of private equity on product markets, using detailed price and sales data for an extensive number of consumer products. In the years following a buyout, target firms increase sales by 53% compared to matched control firms. Price increases—roughly 1% on existing products—do not drive this growth. The launch of new products and geographic expansion do. Competitors lose shelf space and marginally raise prices themselves. These growth results hold in particular for private firms, while public targets in fact contract. Private equity thus appears to ease financial constraints, provide expertise to manage growth, and reduce investment where needed. Our findings question the common view that private equity substantially increases prices, harming consumers.

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I. Introduction

Private equity firms have raised more than $3 trillion in capital over the last five years, exercising a growing influence on the day-to-day purchases of millions of consumers.[1] Private Equity (PE) firms' goal is simple: acquire businesses, and exit with gains. How they achieve gains, however, is an open question. Do PE firms simply transfer wealth using financial engineering strategies[2] or do they create wealth by improving firm operations? Consistent with the wealth creation channel, studies show that PE firms improve total factor productivity (Davis et al., 2014) and managerial practices (Bloom et al., 2015, Bernstein and Sheen, 2016), focus patenting activity (Lerner et al., 2011), increase employee safety (Cohn et al., 2016), and reduce agency problems (Edgerton, 2012).

Firms, however, exist to sell products and services. Despite this, the effects of private equity on target firm outputs has received little academic attention. Thus in this paper, we use micro-level retail scanner data to study private equity's strategies in the consumer product market. We answer the following basic questions: What happens to prices? Does the product mix change? And does product availability expand or contract? Answering these questions helps shed light on whether and how PE firms attempt to create wealth. It also provides insight into how private equity impacts consumers, a topic under constant scrutiny by policy makers and the media. We find that, in the years following the buyout, target firms increase sales by 53% on average compared to matched control firms. Price increases do not drive this sales growth. The launch of new products and geographic expansion do.

[1] Bain and Company (2018) reports that Private Equity firms have raised $701 billion globally in 2017, reaching a total level of over $3 trillion in the 2012-2017 period. A series of articles published by the New York Times, titled "This is Your Life, Brought to You by Private Equity" 12/24/16, highlights the extensive influence of Private Equity on consumers.

[2] Exploiting tax rules, extracting dividends, or repackaging assets are among the most common financial engineering strategies used by private equity firms.

We compile monthly store-level prices and unit sales for over 1.7 million unique consumer products sold in over 41,000 locations in the United States between 2006 and 2014. This sample covers over 50% of grocery and drug store sales and over 30% of mass merchandiser sales in the United States. The data is remarkably detailed. For example, we can see that in the first week of August 2008, twenty-four cans of Del Monte French Style green beans were sold in a particular store in Chicago at an average price of $1.15 per can. We link each product to its parent company. Private equity firms acquired 142 of these companies over our sample period.

We test for changes in product prices and sales, innovation, and availability after a PE buyout. Specifically, we first match each private equity target with a similar counterfactual at the time of the private equity event. We go beyond the firm-level match commonly used in the literature; the granularity of our data allows us to compare product lines and even products within the same store. Each of these different treatment-control pairs represents a cohort. We then stack cohort-level observations and run a generalized difference-in-differences estimation.

We begin by documenting that in the five years post-buyout private equity targets increase revenues by 53% on average compared to matched control firms. Price increases do not drive this growth. In fact, the average price of the products in a firm's product line increases by only about 4% relative to competitors. Further, this increase is primarily a composition effect from the introduction of more expensive products or increased sales in richer areas. A particular product's price in fact increases by only about 1% relative to competing products sold in the same store.

Volume growth, therefore, must drive revenue growth. How do firms increase units sold? First, PE targets increase the variety of products offered by 16% more than matched un-

treated firms. Faster new product introduction and slower discontinuation account for the increase in product variety. These new goods sell without cannibalizing their original lineup, which maintains pre-PE sales rates. Second, this innovation occurs mostly in existing product lines as there is little evidence of diversification into new consumer categories. Finally, PE product availability expands geographically into new stores (+23%), new retail chains (+10%), and new zip codes (+15%).

Firms that compete with PE targets are affected by the deals. They also increase prices marginally following the buyout—less than half of one percent. This evidence is consistent with typical oligopoly models of rivals' behavior when one firm raises prices. Competing firms' product variety slightly falls, likely crowded out by the new offerings from PE firms.

How do private equity firms enable this growth? In other words, why weren't target firms undertaking these actions on their own? To address this question, we separately analyze private and public targets. We have indeed a comprehensive sample of deals, not just buyouts of public firms or firms that eventually go public. We find that new product introductions and increased geographic availability are particularly strong among private targets. In contrast, in public targets there is no expansion of product offerings, and store counts and geographic locations even contract. This evidence suggests multiple mechanisms. For private targets, private equity may provide capital and managerial expertise on how to manage growth (Boucly et al., 2011, Bloom et al., 2015). For public targets, the discipline of debt and alignment of incentives may rein in overinvestment (Jensen, 1986). We also analyze PE firm behavior based on product category concentration, as measured by the Herfindahl-Hirshman Index (HHI). PE product growth and expansion is stronger in product markets that are less concentrated, possibly because of lower barriers to entry.

A caveat in interpreting our results is that we cannot unambiguously conclude that pri-

vate equity firms cause target firms to increase sales, product innovation, and geographic expansion, as the "private equity treatment" is not randomly assigned. The empirical strategy used in this paper follows and expands on the approach commonly used in the literature to deal with this endogeneity concern. Initially, we match treated firms with similar in the pre-buyout period untreated firms. A problem in this approach is that firms might differ across a multitude of observable and unobservable characteristics, leading to poor matches. We are able to mitigate this concern by exploiting the granularity of our data: we match not only across similar firms, but also across similar product categories and products themselves. In other words, we can use store shelf neighbors as counterfactuals. For example, we can compare a can of green beans sold by a target firm with a can of green beans sold by an untreated firm in the same store. This specificity curtails—though does not eliminate—the role that unobservables could play in explaining our results.

Our work contributes to the empirical literature on the effects of private equity on corporate performance and behavior. Chevalier (1995) documents that supermarket LBOs have incentives to raise prices, but the overall market impact depends on competitive structure: local market grocery price indices rise when rivals have high leverage but fall when rivals are concentrated and in stronger financial positions. Our analysis differs along several dimensions: we study consumer goods manufacturers, pinpoint firm and product-level price changes, and investigate non-price product market effects such as innovation and geographic availability. Moreover, we provide evidence on PE deals completed in the 2000s in contrast to the supermarket deals of the 1980s, an important comparison given the evidence that PE strategies have evolved significantly over the past few decades (see, e.g Guo et al., 2011). Our results that PE firms spur growth complement the evidence in Boucly et al. (2011) that French target firms increase profitability, sales, debt issuance, and capital expenditures

compared to control firms. Our evidence that PE deals do not seem to harm consumers also dovetails with findings that private equity could benefit firm stakeholders by, for example, promoting a more efficient reallocation of the workforce (Davis et al., 2014), reducing work-related injuries (Cohn et al., 2016), increasing employee technological human capital (Agrawal and Tambe, 2016), and improving sanitation and food-safety (Bernstein and Sheen, 2016).

II. Hypotheses Development

What happens in the product market after private equity buyouts? A popular view in the media is that businesses suffer under PE ownership. To generate cash flows, "you can expand the company, but more likely you slash costs, close divisions, cut staff, curtail marketing, eliminate research and development and more. In other words, cutting to the bone."[3] If PE firms follow such a strategy, target companies could trim product offerings and raise prices to boost short term cash flow.[4] Scaling back investment could also be optimal for some target firms. Agency theory (e.g., Jensen, 1986) predicts that managers might engage in empire building. The added leverage and incentive alignment typical in PE buyouts might, therefore, impose discipline. If lower prices stem from an overinvestment in market share, then private equity firms could raise prices. Analogously, if firms are selling too many products in too many places, private equity could prune product offerings and distribution. Last, liquidity constraints imposed by increased leverage could also lead to higher prices (Chevalier and Scharfstein, 1996).

An alternative and more recent stance on the role of private equity would predict, instead,

[3] *Wall Street Journal* on 3/29/15.

[4] Kosman (2009) devotes an entire chapter to "Lifting Prices" in his book "The Buyout of America."

post-buyout product market expansion. Surveying PE firms, Gompers et al. (2016) find that in target firms revenue growth is pursued more aggressively than cost cutting. Nonetheless, the authors acknowledge that PE firms may have incentives to overstate the former and understate the latter. Analyzing data from 839 French PE deals, Boucly et al. (2011) indeed find that buyouts appear to infuse capital and relax credit constraints, as target firms grow faster and become more profitable than their peers, particularly when capital might be most dear ex ante. Bloom et al. (2015) find that private equity may bring better management practices to target firms. If these mechanisms are at play, we expect to see expansion in product offerings and geographic penetration. Implications for pricing, however, are unclear. New or better products might be more expensive. On the contrary, leaner manufacturing or more skillful bargaining with retailers could lead to lower prices.

These contrasting predictions can co-exist in the cross-section of target firms. For example, agency theories might better describe dynamics in more mature industries and for publicly traded firms (Jensen, 1986). Capital constraints may be more relevant for private or small firms (Farre-Mensa and Ljungqvist, 2016). Bloom et al. (2015) find that private firms are more in need of managerial expertise than public firms. Davis et al. (2014) document employment growth following private firm buyouts but contraction after public deals. Boucly et al. (2011) find stronger growth results for private-to-private buyouts. We also take into account the level of competition in product markets (low vs. high concentration in product categories). Chevalier (1995) reports that local market prices fall when rivals are concentrated and stronger financially and rise when competitors are weaker.

III. Data Description

A. Nielsen Retail Scanner Data

We combine private equity buyouts and retail store scanner data in our analyses. Product market data comes 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 sample 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 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 identifies products by name and Universal Product Code (UPC). The data are very specific. For example, Table I lists all products available under the category "Canned Green Beans" in a specific grocery store in Austin, Texas, in December 2007. Seventeen green bean products are sold in the store differing in brand (e.g. Del Monte, General Mills), type (e.g. organic, French style), and size (e.g. 8oz, 14.5oz). We exclude UPCs that do not identify unique products (e.g., private label products, products temporarily sold in different size). For each product, each week, in each store, we know the average price, units sold, and total sales. We introduce summary statistics in Panel A of Table II. The average product is sold in 589 stores and an average store carries over 18,000 products. Nielsen groups items into mutually exclusive groups such as "Vegetables-Beans-Green-Canned," "Fabric Softeners-Liquid," or "Vacuum and Carpet Cleaner Appliance." These are called "product categories" and should be thought of as highly-specific industry definitions. Panel B of Table

II shows that there are 1,123 different product categories with an average of 20 items sold nationally by roughly 4.5 firms per category per store.

We match each UPC code to its parent firm. The GS1 organization oversees the management of UPC codes. Manufacturers 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 exactly match 82% of the UPCs in the data to a GS1 company prefix. We map the remaining UPCs to companies by assuming that UPCs in the same firm share the first eight digits. In Panel C of Table II, we present the characteristics of the sample's nearly 48,000 firms. The average firm sells 10.4 products from 2.9 product categories in 1,391 stores through nine retail chains.

The data allows us to precisely define competitors, market structure, and plausible counterfactuals. We aggregate the data at the monthly level to shrink the dataset to a manageable size.[5] The monthly frequency allows us to accurately capture when firms introduce new products, discontinue products, and expand existing products into new markets. Notwithstanding the richness of the data, we miss two important pieces of information. First, we observe the prices paid by consumers–the sum of the wholesale price and retailer markup. We cannot say with certainty which of these two price components drives our results. That said, whether PE firms are changing wholesale prices or influencing retailers to change margins, the ultimate effect on the consumer is the same. Second, we do not observe manufacturing costs and markups and, thus, we cannot draw direct conclusions about the profitability or optimality of firms' decisions before or after the private equity deal.

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

B. Private Equity data

We obtain data on private equity deals from Capital IQ. We select all "closed" majority stake transactions classified as "Leveraged Buyout", "Management Buyout", "Secondary Buyout", "Going Private Transaction", or whose investment firm type is "PE/VC". We study only deals closed between 2007 and 2013 as we require at least one year of product market data before and after each deal, and the Nielsen data spans 2006-2014. We find 142 private equity deals after matching firm names between Capital IQ and Nielsen/GS1. Of these deals, 125 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 average sales in our sample. These are not necessarily the targets with the greatest deal value, just those more present in the consumer product categories we analyze. Table A3 in the online appendix lists the most common private equity partners in our sample.

IV. Empirical Methodology

A. Research Design

Private equity firms do not randomly select companies. As shown in Table A1 in the online appendix, they are more likely to target product categories that are less concentrated, firms that are smaller, and products that are cheaper than competitors. While a comprehensive study of the characteristics of firms and products taken over by private equity is

beyond the scope of this study, we can adopt an identification strategy that controls for these observable trends. An advantage of our setting is that our detailed data allows us to match each treated unit with a very similar counterfactual.

While the matching strategy approaches the ideal randomized control experiment, it does not completely solve endogeneity problems. There are two outstanding concerns. First, while we control for pre-deal observable characteristics, there could be unobserved characteristics that explain differences in post-event outcomes. Second, even if we could match on all pre-deal characteristics, a firm could still be targeted because it is expected to change in the future. We find evidence that alleviates the first concern: after the match, treated and control groups are similar also on the observable variables that we do not use in the matching procedure. The granularity of the data helps with the second concern. We are able to compare, for example, two cans of green beans on the same store shelf. While it is possible that one brand has a different trajectory than another (e.g., buzz from an advertising campaign), matching with such specificity certainly reduces the scope of variation (e.g., we control for a sudden increase in green bean popularity).

B. Matching Procedure

We first identify firms and products taken over by private equity firms. We then match each firm, product line, 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-differences regression specification on this stack of cohorts.

We match each of the 142 treated firms and 1,039 treated firm-categories with a similar counterfactual based on four variables measured at the time of the private equity deal: the

number and growth rate of products sold, and the level and growth rate of the average price of products sold. We match with replacement each treated unit with the closest control using the Abadie and Imbens (2006) distance metric that weights each dimension 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.

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 142 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

Our main empirical analysis employs a stacked cohort generalized difference-in-differences strategy. Essentially, we take the difference in outcome for each treated unit i (firm, product-category, or product) 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 from 24 months before the event to 60 months afterwards. We choose the pre-window to have enough periods to test the parallel pre-trend assumption. We selected the post-window to 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 versus before the private equity deal. The time-cohort fixed effect $\delta_{t,c}$ ensures 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 buyout. 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 month level to adjust for heteroskedasticity and serial and cross-sectional correlations in the error term (Bertrand et al., 2004).

The high-frequency data allows us to test if the parallel pre-trend assumption holds. We can also learn how quickly private equity firms implement change. We estimate the impact of private equity month-by-month, using the equation below:

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

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

V. The Effect of Private Equity on Target Firms

A. Sales and Prices

A.1. Firm and Product Category-Level Analysis

What happens to the sales and pricing of goods sold by firms acquired by private equity? We start by analyzing sales, average product prices, and units sold at the firm level. Each target firm is matched to an untreated firm as described in section IV.B. Panel A of Table IV shows estimated coefficients of regressions of each firm's log sales, weighted average log price, and log of units sold on *After*, a dummy variable that equals one for firm-month observations after the private equity deal for target firms. We find that revenues relative to a matched firm increase dramatically, by 53%, in the years following the deal. This result is consistent with papers that document growth following PE buyouts (e.g. Boucly et al., 2011). A 46% increase in units sold drives this growth. The average price per firm remains unchanged. We compute these average product prices by dividing total revenues by units sold for each firm in each month. This is a very rough measure of prices—it combines all categories, products, and stores into a single number. This measure will thus vary with compositional changes. While it could capture well overall trends in pricing for smaller and single category firms, the average price per firm might not be very informative for larger firms that sell both cheap and expensive items.

To better understand price dynamics and what ultimately drives changes in sales and units, our next step is to begin "peeling the onion". We break the unit of analysis down from the firm to the firm-category. This sharpens the analysis in three ways. First, it increases the quality of the match. For example, rather than comparing prices and sales of Del Monte and General Mills overall, we can now compare only their green beans. Second,

it allows us to separate changes in existing product categories from changes in the category mix. Last, it controls for heterogeneous effects from categories having different players, competitive dynamics, and trends. The 142 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 American Roland Food Corp. We match each treated firm-category with the same category of an untreated firm with similar number and growth of products, and level and growth in prices.

In Panel B of Table IV, we regress the logs of revenues, units sold, and average nationwide prices for a firm in a particular product category on the *After* variable. With the exception of prices, this breakdown at the product category level mimics the firm-level results. With the greater precision achieved by isolating pricing in detailed categories, we in fact find that average prices of private equity firms increase by 4.2% relative to matched firms, statistically significant at 1%. Sales increase by 23.3% and units sold by 16.1%. These point estimates for units and revenues at the category level are a little smaller than at the firm level, suggesting that PE firm targets may be expanding to new categories. We explore this in the next section which examines innovation.

Figure 2 plots the trend in log sales and average log prices over time with a 90% confidence interval. The graphs show no obvious pre-trend in sales or price before the private equity buyout. This provides comfort that we are comparing similar firms and firm-categories. After the event, at the product-category level, there is a gradual increase in both sales and prices over the next 3-5 years; PE firms take time to implement change.

A.2. Product-Level Analysis

After a PE buyout, we find small price increases and large unit sales increases at the category level. Multiple paths can generate these results; distinguishing between them is important for understanding both PE growth strategies and their effects on consumers. The relative increase in average nationwide category-level prices could be achieved by simply marking up existing products. Alternatively, the composition of goods sold within category could shift towards more expensive upmarket varieties (e.g., introducing a premium organic variety of an existing product), or the firm might be growing share in markets or retailers that charge more (e.g., New York City, Whole Foods). Consumers dislike higher prices on goods they already buy but could welcome greater access or choice of new varieties, even if more expensive. Analogously, different strategies could drive the increase in overall firm-category units sold. For example, firms could gain share within a store or expand to new stores or geographies.

To peel the onion further, we analyze individual products. A product is uniquely identified by its UPC code. Our empirical strategy matches each treated product in each store with a competing same-category untreated product in that same store. In other words, we use store shelf neighbors as counterfactuals. This allows us to tease apart changes to existing products from composition and location expansion 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 also run specifications with cohort trios, matching each treated product with two untreated competitors. This increases the number of observations by 50%. We regress the logs of sales, average price, and units on *After*, product-cohort fixed effects, and cohort-time fixed effects. The results are in Table V.

We find a marginally statistically significant 1% increase in the price post-PE for a given treated product relative to a competing product in the same store. Though potentially meaningful for the target firm's profitability, this magnitude is likely marginal for consumers. This 1% increase for existing products also implies that the average category price increase of 4.2% (shown in Table IV) must be due to a composition effect: adding or shifting consumer tastes to products that are more expensive or expanding to locations with higher prevailing prices or cost of living. Results on revenues and units sold differ substantially from our previous findings in Table IV; both *After* coefficients are zero. This means that existing products are not gaining share within their current stores. Some combination of selling new products or selling in new places must, therefore, drive unit and revenue increases at the firm and category level. Next, we explore innovation and geographic availability.

B. New Product Development

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 a leveraged buyout, firms increase their patenting activity and produce more influential patents, suggesting either a relaxation of financial constraints or reduced agency problems. While patents capture the early stages of innovation, our data allows us to study the end result with the release of new products.

Mimicking the price analyses, we first answer these questions at the overall firm level. We match each of the 142 firms acquired by private equity with a non-private equity-owned firm with the closest number and growth of products, and level and growth in prices. The unit of analysis is a firm-month. Table VI illustrates the effect of private equity on product innovation. *Number of Products* is the log of the number of unique UPCs a firm sells at

time t. *New products* is a dummy equal to one if at least one new UPC is introduced by the firm during that month. *Discontinued Products* is a dummy equal to one if a product is discontinued by the firm during that month, meaning the UPC never reappears again in the sample. We drop the first and last six months of the sample to allow enough time to ensure that new UPCs really are new and discontinued UPCs do not reappear. Finally, *Number of Categories* is the log of the number of product categories, out of a total of 1,123 defined by Nielsen, in which a firm sells at time t.

In Panel A of Table VI we compare product innovation across firms. Column 1 shows that firms run by private equity expand their selection of products offered (distinct UPCs) by 16.1% after their acquisition, relative to matched firms. PE firms can achieve expansion by introducing new products or dropping fewer products. Columns 2 and 3 show that both channels are at work. Private equity-run firms are 2.3% more likely to introduce a new product and 2.9% less likely to discontinue an existing one. We also examine whether targeted firms are more likely to expand into new product categories. In column 4, the coefficient on $After$ is positive but not significant. This evidence suggests that the increase in product variety primarily happens within existing business lines.

To confirm this interpretation, in panel B we run analyses at the firm-category level. We compare each treated firm-category with the same category of an untreated competitor. Within a category, private equity controlled firms do indeed increase their unique product portfolio by 5.5% relative to their pre-private equity ownership days. New product introductions increase at a faster rate while discontinuations are unchanged. Recalling that Table V showed that existing products did not decline in sales, these new products appear not to cannibalize existing goods. The magnitude of the firm-level UPC increase (16%) is larger than the category-level increase (6%). This suggests there could be some expansion into

new categories/industries, consistent with the positive, but not statistically significant, coefficient on *Number of Categories* in panel A. Figure 3 shows that product innovation happens gradually over the years following the private equity buyout.

Overall, private equity firms boost the number of new products and reduce discontinuation, resulting in a greater variety of products sold. These firms remain focused; there is only marginal evidence of greater diversification into new industries. Closing the loop, since average category-level prices rise for these private equity treated firms, these new products must be slightly higher priced. And since there are more products for sale, this partially explains why overall units sold for treated firms grow despite no change to existing product growth at the store level.

C. Product Availability

Firms bought by private equity increase their units sold and revenues at a faster rate than competitors. The previous section shows that introduction of new products helps drive this result. In addition, private equity may facilitate geographic expansion.

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 post-buyout firm-month or firm-category-month for target firms. Column 1 shows that firms increase the number of stores in which they sell their products by 22.7% after they are acquired by 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 indeed that private equity firms increase the number of retail chains by 9.5% after the private equity event. How widespread geographically is this expansion? Column 3 shows

that private equity firms expand to 15.0% more 3-digit ZIP codes[6]. The results in panel B, where the unit of analysis is a firm-category, are similar. Figure 4 shows that this expansion occurs steadily over the years subsequent to the deal close date.

VI. Competitor Response

The results thus far show what happens to private equity treated goods relative to a matched competitor. Competitors, however, do not necessarily stand still. In this section, we investigate how competition responds to PE entry. Added to relative changes, these results help reveal absolute changes to product characteristics and the ultimate impact felt by consumers.

A. Competitor Response: Prices

Prices on existing products taken over by PE increase by about 1% relative to matched products. This could be the result of private equity firms keeping prices constant while competitors lower prices in an attempt to run highly leveraged private equity firms out of business. Alternatively, the price effects could be bigger than the small ones we have previously estimated if competitors also increase prices. Whether rivals match PE price increase behavior, as typical oligopoly models would predict, or seize an opportunity for predation is an empirical question.

To identify the pricing response of competitors to private equity entry, we exploit geographic variation in a given competitor's exposure to a PE buyout. As an example, assume that Del Monte, a private equity takeover target, sells green beans in store A but not in

[6]Counties, Designated Market Areas, and states all give similar results.

store B. General Mills, who is not private equity owned, sells green beans in both stores. We compare the price response of General Mills in store A, which faces PE competition, to its response in store B, which does not. We attribute a differential price response in the months following the buyout to the PE deal.

Specifically, we first extract the non-PE products that face a PE competitor using the same-store analysis of section IV.B. We then identify all the stores where these products are sold absent the PE competitor. Given that each product is sold in thousands of stores, we select ten random stores, and among these we select the closest match in terms of price level and growth to the non-PE product which does face a PE rival. These two product-stores form a cohort.

In Table VIII, *After* is a dummy variable which equals one for non-PE products after the private equity deal, in stores where the private equity product is also sold. As with the same-store product analysis, we include product-cohort fixed effects and time-cohort fixed effects. In Panel A, Column 1, the coefficient on *After* is 0.4% and significant, suggesting that private equity leads direct store competitors to raise prices, but only marginally—less than half a percent. To check that it is not the retail chain that is responsible for these price changes, in Column 2 we require that all the eleven stores (ten which sell only the non-PE product, one which also sells the PE entrant) used to create the product-store cohorts are selected from the same retail chain. Perhaps the store that sells both the PE product and non-PE competitor is located in an area that is experiencing price changes. Thus in Column 3 we require that all stores used to define the cohorts are in the same Designated Market Area. The coefficients on *After* in these regressions are 0.3% and 0.2% and still significant.

Private equity entry thus leads competitors to raise prices in stores where they compete directly, but the magnitudes are small. Figure 5 plots the price response (from Column 1)

over time. Interestingly, the change to pricing is immediate. This evidence suggests that the response is an actual price increase to existing products as opposed to a gradual increase due to introduction of new, more expensive varieties. Added to the relative price increase for a given product of approximately 1% for PE-owned goods, the results in panel A suggest the absolute PE price increase is 1.2 to 1.4%.

B. Competitor Response: Product Mix

Private equity targets boost product introduction and thus increase variety. How do competitors respond? To address this question we analyze if, after the buyout, there is a change in the number of unique products these competitors stock on shelves in stores where they compete with the PE firms vs. stores without this competition. Although similar in spirit to our investigation of competitor price response, in practice there are two differences in how we implement this analysis. First, the treated units are now firm-categories (and not product-stores) where at least one competitor has been overtaken by a PE firm during our sample period. Second, the untreated units are the firm-categories from all the ten random stores selected in Panel A. That is, we do not match on the closest product-category, but use all the ten stores as control group.

We present these results in Table VIII, Panel B. In Column 1, we find that the average competitor decreases product variety by 1.5% more in stores with a PE buyout than in stores without (statistically significant at 1%). Column 3, which makes sure all 11 stores in each cohort—the one treated plus the ten untreated—come from the same Designated Market Area, shows similar results. Unlike with prices, where competitors respond in the same direction as their PE shelfmates, product variety responds in the opposite direction. One likely explanation for this finding is that shelf space is finite; more aggressive PE product

introduction appears to crowd out competitors. In Column 2, each cohort comprises eleven stores all in the same retail chain. Here, PE competition does not differentially impact competitor response in that store. It appears that, within a retail chain, a firm's product selection moves more in unison across all stores.

VII. Mechanism

Private equity deals result in slightly increased prices but significantly higher sales, primarily through aggressive introduction of new products in new locations. How do private equity firms achieve these results in practice? Do they employ a "one size fits all" approach to their targets? In this section we investigate the mechanisms at play by exploiting cross-sectional variation along two dimensions: public versus private targets, and variation in industry concentration.

A. Public versus Private Targets

Public and private firms may reside at different points in their life cycles. They could also require different types of assistance or face different challenges. Private firms are more often constrained financially (Farre-Mensa and Ljungqvist, 2016), while public firms are often more mature and could be more subject to agency problems and overinvestment (Jensen, 1986). In Table IX, we rerun our sales, price, product innovation, and product availability tests separately on public and private PE firm targets. Of the 142 treated firms, 125 are private and 17 are public. We find strikingly different results when we split the sample between public and private targets.

In Table IX, Panel A, we present results on pricing strategies. We first introduce evi-

dence at the firm-level on changes in revenues, average prices, and units sold after private equity acquisition relative to a matched untreated firm. In the pooled sample (Table IV, Panel A), we find that post-PE prices do not change, while units and revenues dramatically increase. These same results hold for private target firms: sales increase by 70.8% and units sold by 61.3%. Although not statistically significant at conventional levels, we find similar magnitudes with the opposite sign—that is, contractions in sales and units—for public target firms. We then analyze the effects at the firm-category level. Compared to the entire sample (Table IV, Panel B), we find again very similar results for private target firms. At the category level, private firms increase sales by 36.2%, average prices by 5.4%, and units sold by 26.7%. For public firms, the point estimates on units and sales are again negative, but these results lack statistical significance. The relative category-level declines are much smaller in magnitude than the firm-level drops, suggesting public firm targets may be closing or selling entire product lines. We last look at products in the same store. We use here store shelf neighbors as counterfactuals, mimicking the analysis in Table V. Private target firms increase sales by 5.3% and units by 3.2%, while the effect on prices is not statistically significant (although the point estimate is very close to the value found in the overall sample). The results on public firms are all statistically significant. They reduce sales by 9.6% and units by 10.0%, but increase prices by 1.2%. Overall, the results on pricing strategies seem to suggest that PE firms increase sales and units only in private companies. We generally find an opposite effect for public targets.

In Table IX, Panel B, we present the results on product innovation. In Table VI, we document how, in the entire sample, after a private equity takeover the variety of products offered increases, primarily in the target's existing business lines. We again find that this overall result masks substantial differences between public and private target firms. For

private firms we find an increase in new products at the firm level by 18.6%. This increase seems to happen both by expanding into new product categories (4.7%) and increasing the number of products within existing categories (8.0%). For public firms we observe roughly opposite patterns with a reduction in the number of categories at the firm level (12.4%) and a higher likelihood of discontinuing products at the firm-category level (1.8%).

In Table IX, Panel C, we investigate geographic expansion. Private firms drive entirely the strong growth in geographic availability in the overall sample (see Table VII). Private firms register post-buyout higher growth rates across stores, ZIP codes and states. The results hold both at the firm and firm-category level. Public firms reduce their presence across all geographic areas. Again, these results hold both at the firm and firm-category level.

This divergence in results between public and private firms suggests the existence of both growth and agency motives for private equity deals. Access to financing, managerial expertise, or business connections can help younger, private firms take the next step to expand their product lines. *The New York Times* notes that "business owners with a product to sell often dream of winning shelf space in the Wal-Marts and Targets of the world. But... it is a challenge to get shelf space in any store."[7] Public firms, in contrast, may be overinvesting in market share. Our results of growth for private target firms and contraction for public target firms are consistent with other studies. For example, Davis et al. (2014) document that employment grows following private firm buyouts, while it declines after public deals. Boucly et al. (2011) find stronger growth for private target firms. This variation in deal motivation can also arguably explain the negative portrayal of private equity in the media: layoffs and contraction are associated with the most visible, well-known targets.

[7]"Getting Your Product Onto Retail Shelves" *The New York Times* 10/20/2010

B. Category Concentration

We find that private equity firms spur growth for private target companies. Faster growth can be achieved by relieving financial constraints, accessing better distribution channels, and improving managerial practices (Bloom et al., 2015). In this section we investigate how industry concentration affects private equity firms' product market strategies. We find that our growth results are significantly stronger in less concentrated product market segments, where barriers to entry could be low.

For each of the 1,123 product categories, each month, we calculate the Hirfindahl-Hirschman Index (HHI) value. In practice, we compute the nationwide revenue market share by firm, squaring, and summing these shares, resulting in a value between zero and one. Lower HHI values correspond to lower industry concentration.

In Table X, panel A, we present results on pricing strategies at the firm-category levels. We regress revenues, average category price, and units sold on *After* and *After* interacted with *Category HHI*. Aside from average prices where the coefficient is insignificant, the other interaction terms are all negative and significant. Thus our baseline results of increased sales and units seem to occur largely in product categories that are less concentrated.

In Table X, Panel B, we look at new product introductions. In Panel C, we investigate store and geographic expansion in the presence of competition. In these analyses, all the coefficients on the interaction of *After* and *Category HHI* are negative. Private equity firms seems to prefer product and geographic expansion in less concentrated product categories. This is consistent with the finding in Table A1 that private equity firms are more likely to target industries with low competitor concentration and, potentially, lower barriers to entry.

VIII. Conclusion

Buyout deals often elicit strong 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 stakeholders such as workers and consumers. Using data at the establishment level, Davis et al. (2014) find that 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 establishments and entering more productive ones.

Private equity is exercising a growing influence on the purchases of millions of people. Therefore, we investigate the overall effects of private equity on consumers, using price and sales data for over 1.7 million consumer products from over 41,000 stores. Retail scanner 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 geographic richness of the data permits the study of competitors' response by comparing price changes in locations with and without a PE brand. This empirical strategy mitigates concerns that more general trends—and not the private equity deals—drive competitors' response.

Contrary to the critics' view, we find that target firms raise prices only marginally. Compared to similar products sold in the same store, target firms raise price by about 1.0%. Competitors respond to private equity deals by raising prices, but only in those stores where they face PE competition, and the response is limited–roughly 0.4%. An overall price increase of 1.4% in the five years following a buyout for target firms does not seem to support the view that private equity firms harm consumers on this dimension. Despite the marginal

increase in the price of existing products, target firms experience a significant increase in their overall sales of about 53% in the years post-buyout. Compared to matched firms, target firms launch more products and expand more aggressively geographically and among retailers. Consumers could potentially benefit from private equity deals through an increase in product variety and availability (Kahn and Lehmann, 1991 and Lancaster, 1990).

How do private equity firms spur product innovation and geographic expansion? We find that our results hold only in private targets. These firms 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 could provide easier access to funds and, possibly, the managerial expertise and know-how to manage growth. Overall, our evidence is consistent with the private equity asset class as an avenue of wealth creation and not simply wealth transfer.

REFERENCES

Abadie, Alberto, and Guido W. Imbens, 2006, Large sample properties of matching estimators for average treatment effects, *Econometrica* 74, 235–267.

Agrawal, Ashwini, and Prasanna Tambe, 2016, Private equity and workers' career paths: The role of technological change, *Review of Financial Studies* 29, 2455–2489.

Amess, Kevin, Joel Stiebale, and Mike Wright, 2015, The impact of private equity on firms' innovation activity, DICE Discussion Papers 184.

Bernstein, Shai, and Albert Sheen, 2016, The operational consequences of private equity buyouts: Evidence from the restaurant industry, *The Review of Financial Studies* 29, 2387–2418.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan, 2004, How much should we trust differences-in-differences estimates?, *The Quarterly Journal of Economics* 119, 249–275.

Bloom, Nicholas, Raffaella Sadun, and John Van Reenen, 2015, Do private equity owned firms have better management practices?, *The American Economic Review* 105, 442–446.

Boucly, Quentin, David Sraer, and David Thesmar, 2011, Growth lbos, *Journal of Financial Economics* 102, 432–453.

Chevalier, Judith A., 1995, Do lbo supermarkets charge more? an empirical analysis of the effects of lbos on supermarket pricing, *The Journal of Finance* 50, 1095–1112.

Chevalier, Judith A., and David S. Scharfstein, 1996, Capital-market imperfections and

countercyclical markups: Theory and evidence, *The American Economic Review* 86, 703–725.

Cohn, Jonathan, Nicole Nestoriak, and Malcolm Wardlaw, 2016, How do employees fare in private equity buyouts? evidence from workplace safety records.

Correia, Sergio, 2014, Reghdfe: Stata module to perform linear or instrumental-variable regression absorbing any number of high-dimensional fixed effects, Statistical Software Components S457874, Boston College Department of Economics.

Davis, Steven J., John Haltiwanger, Kyle Handley, Ron Jarmin, Josh Lerner, and Javier Miranda, 2014, Private equity, jobs, and productivity, *American Economic Review* 104, 3956–90.

Edgerton, Jesse, 2012, Agency problems in public firms: Evidence from corporate jets in leveraged buyouts, *Journal of Finance* 67, 2187–2213.

Farre-Mensa, Joan, and Alexander Ljungqvist, 2016, Do measures of financial constraints measure financial constraints?, *Review of Financial Studies* 29, 271–308.

Gompers, Paul, Steven Kaplan, and Vladimir Mukharlyamov, 2016, What do private equity firms say they do?, *Journal of Financial Economics* 121, 449–476.

Guo, Shourun, Edith S. Hotchkiss, and Weihong Song, 2011, Do buyouts (still) create value?, *Journal of Finance* 66, 479–517.

Jensen, Michael C., 1986, Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* 76, 232–239.

Kahn, Barbara E., and Donald R. Lehmann, 1991, Modeling choice among assortments, *Journal of Retailing* 67, 274–299.

Lancaster, Kelvin, 1990, The economics of product variety: A survey, *Marketing Science* 9, 189–206.

Lerner, Josh, Morten Sorensen, and Per Stromberg, 2011, Private equity and long-run investment: The case of innovation, *Journal of Finance* 66, 445–477.

Table I. Example of Product Category: Canned Green Beans

List of canned green bean products available in a 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 II. Summary Statistics

This table presents summary statistics for all variables and data used in the paper. Panel A introduces an overview of the number of products, stores, firms, and private equity deals in the overall Nielsen data. Panel B shows the characteristics of the product categories in Nielsen data. We calculate the Hirfindahl-Hirschman Index (HHI) for each of the 1,123 product categories, each month. Panel C presents firm characteristics in the overall sample. Panels D focuses on product characteristics used in our analyses and split by treatment status.

PANEL A: Overall Sample

	N.
Products	1,723,277
Stores per Product	589
Products per Store	18,122
Firms	47,682
PE Deals	142
Private Target Deals	125
Public Target Deals	17

	N.
Stores	41,309
Chains	91
3-Digit ZIP	877
Counties	251
Designated Market Areas	206
States	49

PANEL B - Product Category Characteristics

	Mean	Median	S.D.
Categories	1,123.0	–	–
Products per Category	20.4	8.0	36.6
Stores per Category	28,818.1	35,228.0	12,421.8
Firms per Category-Store	4.5	2.0	5.9
Herfindal Index (HHI)	0.6	0.6	0.3

PANEL C - Firm Characteristics

	Mean	Median	S.D.
Products per Firm	10.4	3.0	40.5
Stores per Firm	1,390.8	64.0	4,242.9
Chains per Firm	9.1	3.0	15.3
Categories per Firm	2.9	1.0	6.3

PANEL D - Product Characteristics by Treatment

	Control Group			Treated Group		
	Mean	Median	S.D.	Mean	Median	S.D.
Price	4.02	2.99	4.30	3.96	2.87	4.83
Monthly Units Sold per Store	11.38	1.71	50.29	10.72	1.71	43.50
Monthly Sales per Store	22.69	5.68	120.95	21.43	5.20	103.85

Table III. Largest Private Equity Deals

This table shows the largest private equity deals in our sample, sorted by the average monthly sales in the Nielsen dataset. We obtain the deal value by Capital IQ. This value represents the overall deal value, which might include divisions and subsidiaries that do not sell to supermarkets or mass merchandisers.

Target	Deal Date	Monthly Sales ($)	Deal Value ($Mil)
Del Monte Foods Company	8-Mar-11	60,621,360	5,482
H.J. Heinz Company	7-Jun-13	18,415,052	28,686
Evenflo Company, Inc.	8-Feb-07	9,514,464	260
Bradshaw International, Inc.	16-Oct-08	8,892,030	N/A
Peet's Coffee and Tea, Inc.	29-Oct-12	7,129,329	1,010
Armored AutoGroup Inc.	5-Nov-10	4,919,370	755
The Topps Company, Inc.	12-Oct-07	4,236,158	385
Parfums De Coeur Ltd.	5-Sep-12	4,215,831	N/A
Old Orchard Brands LLC.	2-May-07	4,209,390	N/A
Hoffmaster Group, Inc.	15-Oct-07	3,491,675	171

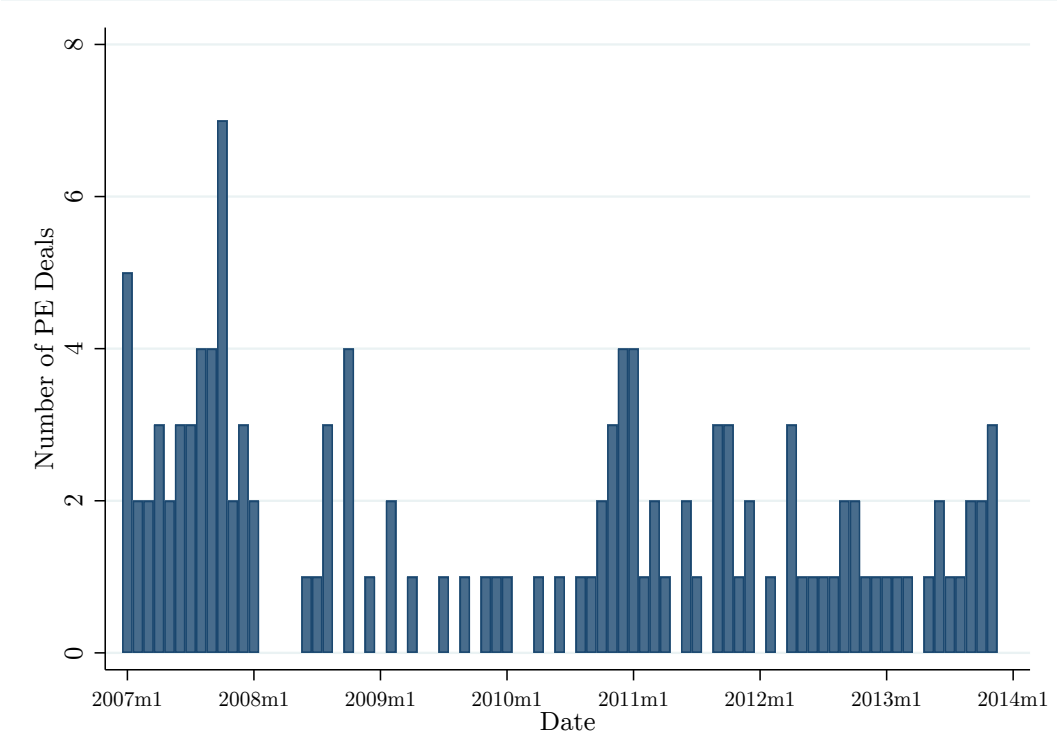


Figure 1. Private Equity Deals Over Time

This figure shows the monthly number of private equity deals in our sample from January 2007 to December 2013.

Table IV. Private Equity, Sales, and Prices

This table presents OLS coefficient estimates from regressing logs of sales (Column 1), average monthly prices (Column 2), and units sold (Column 3) on *After*, a dummy equal to one for the post-buyout months for firms (Panel A) or firm-categories (Panel B) that underwent a buyout during our sample period. 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. 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. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). Standard errors are double-clustered by firm and month. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Within Firm

	Sales	Average Prices	Number of Units Sold
After	0.528***	0.006	0.462***
	(3.50)	(0.39)	(3.31)
N. Obs.	17,406	17,406	17,406
Firm-Cohort FE	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes

Panel B: Within Firm-Category

	Sales	Average Prices	Number of Units Sold
After	0.233***	0.042***	0.161**
	(3.29)	(4.72)	(2.55)
N. Obs.	117,468	117,468	117,468
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes

(a) Sales - Within Firm

(b) Price - Within Firm

(c) Sales - Within Firm-Category

(d) Price - Within Firm-Category

Figure 2. Time Trend of Total Sales and Average Price

These figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are total sales for panels (a) and (c) and average price 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 difference in the outcome variables 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 vertical line. The dotted lines show the 90% confidence interval.

Table V. Private Equity, Sales, and Prices: Existing Products in Same Store

This table presents OLS coefficient estimates from regressing logs of sales (Columns 1 and 2), average monthly prices (Columns 3 and 4), and units sold (Columns 5 and 6) on *After*, a dummy equal to one for the post-buyout months if the product was sold by a firm that underwent a buyout during our sample period. Each cohort is a pair of treated-untreated products within the same store-product in odd columns and trio of one treated vs. two untreated products in even columns. The treated unit is matched to the untreated unit(s) with the closest distance in level and growth in both units sold and price at the time of the private equity deal, using the Abadie and Imbens (2006) distance metric. The unit of analysis is unique at the store-product-month level. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). Standard errors are double-clustered by firm and month. $*p < 0.1$, $**$ $p < 0.05$, $***$ $p < 0.01$

	Sales		Average Prices		Number of Units Sold	
After	-0.000	0.002	0.010*	0.011*	-0.015	-0.015
	(-0.00)	(0.08)	(1.85)	(1.85)	(-0.77)	(-0.63)
N. Obs.	521,744,140	782,616,210	521,744,140	782,616,210	521,744,140	782,616,210
N. of Matched UPCs	1	2	1	2	1	2
UPC-Store-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes
Date-Store-Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Table VI. Private Equity and Product Innovation

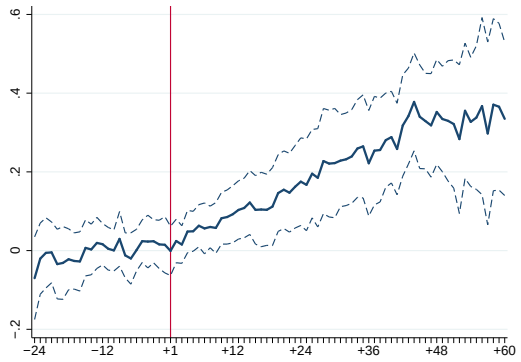
This table presents OLS coefficient estimates from regressing the log of number of products (Column 1), a new product dummy (Column 2), a discontinued product dummy (Column 3), and the log of number of product categories (Column 4) on *After*, a dummy equal to one for the post-buyout months for firms (Panel A) or firm-categories (Panel B) that underwent a buyout during our sample period. We measure the number of products by counting 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 product in that month. We measure number of categories by counting the categories in which a firm has at least one product on store shelves in that month. 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. 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 closing date of the private equity deal. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). Standard errors are double-clustered by firm and month. $*p < 0.1$, $** p < 0.05$, $*** p < 0.01$

Panel A: Within Firm

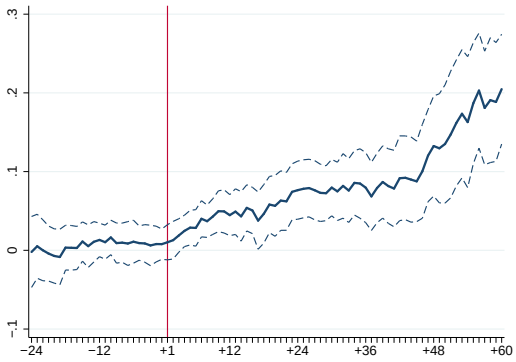
	Number of Products	New Products	Discont. Products	Number of Categories
After	0.161***	0.023**	-0.029**	0.027
	(4.34)	(2.15)	(-2.24)	(1.08)
N. Obs.	17,406	21,510	21,510	17,406
Firm-Cohort FE	Yes	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes	Yes

Panel B: Within Firm-Category

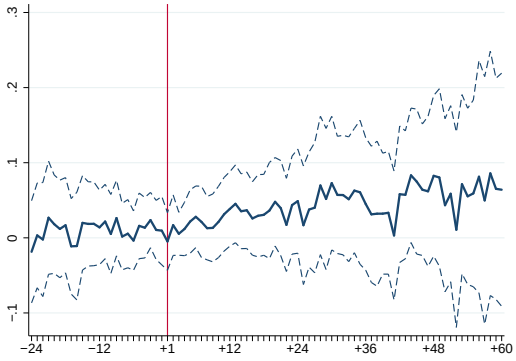
	Number of Products	New Products	Discont. Products
After	0.055***	0.011***	0.001
	(4.10)	(2.78)	(0.25)
N. Obs.	117,468	128,764	128,764
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.Cohort FE	Yes	Yes	Yes



(a) Number of Products - Within Firm



(b) Number of Products - Within Firm-Category



(c) Number of Product Categories - Within Firm

Figure 3. Time Trend of Product Innovation

These 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 difference in the outcome variables 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 closing date of the private equity deal, indicated by the vertical line. The dotted lines show the 90% confidence interval.

Table VII. Private Equity and Product Availability

This table presents OLS coefficient estimates from regressing the logs of number of stores (Column 1), number of retail chains(Column 2), and number of 3-digit ZIP codes (Column 3) where a firm or firm-category is present on *After*, a dummy equal to one for the post-buyout months for firms (Panel A) or firm-categories (Panel B) that underwent a buyout during our sample period. 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. The unit of analysis is unique at the firm-month level in panel A and the firm-product category-month level in panel B. The estimation period goes from -24 months to +60 months around the closing date of the private equity deal. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). Standard errors are double-clustered by firm and month. $^{*}p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

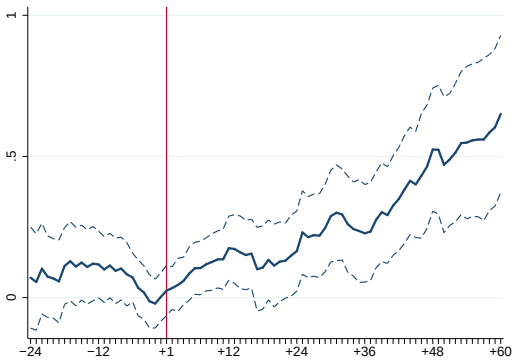
Panel A. Within Firm

	N. Stores	N. Chains	N. ZIP Codes
After	0.227**	0.095***	0.150**
	(2.36)	(2.74)	(2.15)
N. Obs.	17,406	17,406	17,406
Firm-Cohort FE	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes

Panel B. Within Firm-Category

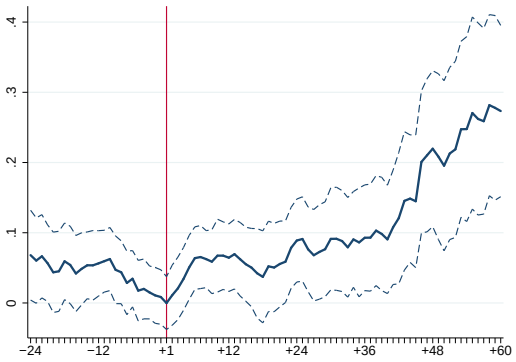
	N. Stores	N. Chains	N. ZIP Codes
After	0.123**	0.039*	0.093**
	(2.17)	(1.90)	(2.32)
N. Obs.	117,468	117,468	117,468
Firm-Category-Cohort FE	Yes	Yes	Yes
Date-Category-Cohort FE	Yes	Yes	Yes

(a) N. of Stores - Within Firm

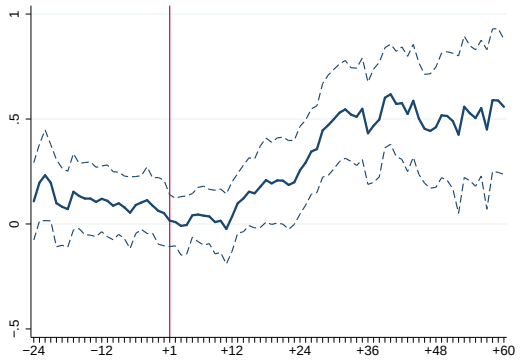


(b) N. of Stores - Within Firm-Category

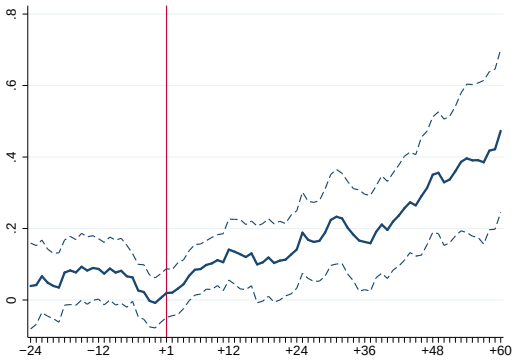
(c) N. of Retail Chains - Within Firm



(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 4. Time Trend of Product Availability

These 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 panels (c) and (d), and the number of 3-digit ZIPs for panels (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 difference in the outcome variables between PE firms/firm-categories and matched non-PE firms/firm categories t months away from the closing date 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 vertical line. The dotted lines show the 90% confidence interval.

Table VIII. Competitor Response

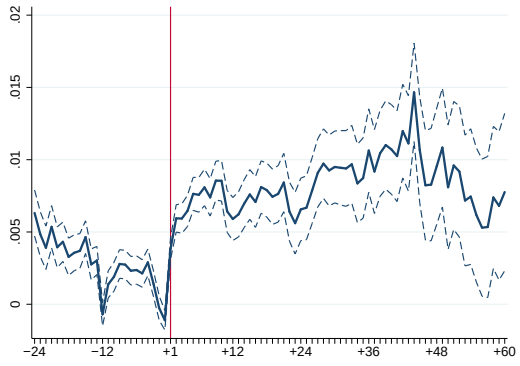
This table presents evidence from product-stores (Panel A) or firm-categories (Panel B) whose firms did not go through a private equity deal. In Panel A, we present OLS coefficient estimates from regressing the log of average monthly prices on *After*, a dummy variable equal to one in the post-buyout months if the treated product was competing in the same store-category with at least one product that underwent a buyout during our sample period. Each cohort is thus made of a treated product sold in a store with PE competition and a matched control product—with the same UPC—sold in different stores without private equity competition. In practice, for each treated product we randomly select ten of these stores without PE competition. Among these ten stores, we then choose the closest match based on the level and growth in the product-store price before the deal, using the Abadie and Imbens (2006) distance metric. In Column 1, we randomly choose ten among all the stores in the US to select the match. In Column 2, we choose the ten stores within the same retail chain of the treated product. In Column 3, the ten stores are from within the same Designated Market Area of the treated product. In Panel B, we present OLS estimates from regressing the log of number of products on *After*, a dummy variable equal to one if in the treated firm-category was competing with at least one product in the same category that underwent a buyout during our sample period. Each cohort is thus made of a treated firm-category sold in a store with PE competition and the same firm-category from ten different stores without private equity competition. In Column 1, we randomly choose the ten store among all the stores in the US. In Column 2, we choose the ten stores within the same retail chain of the treated firm-category. In Column 3, the ten stores are from within the same Designated Market Area of the treated firm-category. The unit of analysis is unique at the product-store-month level in Panel A and the firm-product category-month level in Panel B. The estimation period goes from -24 months to +60 months around the closing date of the private equity deal. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). Standard errors are double-clustered by firm and month. $^{*}p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A. Prices - Within Product-Store

	Full Sample	Same Chain	Same DMA
After	0.004***	0.003***	0.002***
	(7.75)	(8.45)	(4.50)
N. Obs.	4,263,718	3,609,492	3,303,096
Product-Cohort FE	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes

Panel B. Number of Products - Within Firm-Category

	Full Sample	Same Chain	Same DMA
After	-0.015***	0.002	-0.014***
	(-7.98)	(0.79)	(-6.13)
N. Obs.	12,599,090	6,346,356	6,318,078
Product-Cohort FE	Yes	Yes	Yes
Date-Cohort FE	Yes	Yes	Yes



(a) Competitor price response

(b) Competitor product mix response

Figure 5. Trend in Competitor Response

These figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are average monthly prices for panel (a) and number of products for panel (b). The coefficient estimate at time t represents the difference in the outcome variables between treated product-stores/firm-categories and matched controls t months away from the date of closing of the private equity deal. This sample only includes product-stores/ firm-categories whose firms did not go through a private equity deal. In panel (a), each cohort is made of a treated product that is sold in a store-category where a private equity deal occurred, and the best match (with the same UPC) but selected from ten random stores across the US where there is no private equity competitor. In panel (b), each cohort is made by a firm-category where the PE deal occurred, and the average of the same firm-category from ten random stores across the US where there is no private equity competitor. The estimation period goes from -24 months to +60 months around the date of the closing of the private equity deal, indicated by the vertical line. The dotted lines show the 90% confidence interval. Regressions are estimated using the fixed point iteration procedure implemented by Correia (2014).

Table IX. Mechanism: Public Vs Private Targets

This table presents OLS coefficient estimates from regressing, in Panel A, logs of sales, average monthly prices, and units sold on *After*, a dummy equal to one in the post-buyout months if the firm, firm-category, or product-store underwent a buyout during our sample period. In Panel B we focus on product innovation, in Panel C product availability. All the outcome variables are either indicator variables or in logs. Public targets are those deals where the target was either a public company or a subsidiary of a public company before the private equity acquisition. Each cohort is a pair of treated-untreated firms, firm-categories, or product-stores (only for Panel A) where the treated unit is matched to the untreated unit using the same methodologies followed in the previous tables. The unit of analysis is unique at the firm-month, firm-product category-month, or product-store-month (only for Panel A). The estimation period goes from -24 months to +60 months around the closing date of the private equity deal. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). Standard errors are double-clustered by firm and month. $*p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Pricing Strategy

		Public Target			Private Target		
		After	T-stat	N. Obs.	After	T-stat	N. Obs.
Within Firm	Sales	-0.792	(-1.28)	1,950	0.708***	(4.89)	15,456
	Average Prices	0.011	(0.29)	1,950	0.006	(0.32)	15,456
	Units Sold	-0.645	(-1.15)	1,950	0.613***	(4.51)	15,456
Within Firm-Category	Sales	-0.221	(-1.39)	25,350	0.362***	(4.96)	92,118
	Average Prices	-0.001	(-0.05)	25,350	0.054***	(5.58)	92,118
	Units Sold	-0.214	(-1.51)	25,350	0.267***	(4.08)	92,118
Within Product-Store	Sales	-0.096***	-3.73	181,807,906	0.053**	2.34	339,936,234
	Prices	0.012**	2.05	181,807,906	0.009	1.13	339,936,234
	Units Sold	-0.100***	-4.18	181,807,906	0.032**	2.29	339,936,234

Panel B: Product Innovation

		Public Target			Private Target		
		After	T-stat	N. Obs.	After	T-stat	N. Obs.
Within Firm	N. of Products	-0.020	(-0.15)	1,950	0.186***	(4.89)	15,456
	New Products	0.051*	(1.80)	2,006	0.025*	(1.78)	15,200
	Discontinued Products	-0.115***	(-3.20)	2,006	-0.024	(-1.43)	15,200
	Number of Categories	-0.124*	(-1.83)	1,950	0.047*	(1.81)	15,456
Within Firm-Category	N. of Products	-0.033	(-1.46)	25,350	0.080***	(5.34)	92,118
	New Products	0.001	(0.10)	24,534	0.015***	(3.17)	88,030
	Discontinued Products	0.018***	(2.98)	24,534	-0.004	(-0.77)	88,030

Panel C: Product Availability

		Public Target			Private Target		
		After	T-stat	N. Obs.	After	T-stat	N. Obs.
Within	N. Stores	-0.632*	(-1.91)	1,950	0.344***	(3.56)	15,456
Firm	N. ZIP Codes	-0.482**	(-2.31)	1,950	0.236***	(3.27)	15,456
	N. States	-0.245**	(-2.43)	1,950	0.150***	(3.33)	15,456
Within	N. Stores	-0.237**	(-2.01)	25,350	0.225***	(3.71)	92,118
Firm-Category	N. ZIP Codes	-0.191**	(-2.54)	25,350	0.174***	(4.00)	92,118
	N. States	-0.117***	(-3.27)	25,350	0.091***	(3.59)	92,118

Table X. Mechanism: Product Category Concentration

This table presents OLS coefficient estimates from regressing outcome variables of interest on *After*—a dummy equal to one in the post-buyout months if the firm-category underwent a private equity buyout during our sample period—alone and interacted with *Category HHI*, the Herfindahl-Hirschman Index of the product category. 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. 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. The regressions are estimated using the fixed point iteration procedure implemented by Correia (2014). Standard errors are double-clustered by firm and month. *$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A: Sales and Prices - Within Firm-Category

	Sales	Average Prices	Number of Units Sold
After	0.376***	0.044***	0.274***
	(3.67)	(3.56)	(3.00)
After * Category HHI	-0.734**	-0.009	-0.582*
	(-2.04)	(-0.19)	(-1.77)
N. Obs.	117,468	117,468	117,468
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	0.107***	0.017***	-0.000
	(4.99)	(2.83)	(-0.05)
After * Category HHI	-0.264***	-0.033*	0.006
	(-3.99)	(-1.73)	(0.26)
N. Obs.	117,468	128,764	128,764
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.Cohort FE	Yes	Yes	Yes

Panel C: Product Availability - Within Firm-Category

	N. Stores	N. ZIP Codes	N. States
After	0.294***	0.248***	0.149***
	(3.57)	(3.96)	(3.95)
After * Category HHI	-0.879***	-0.795***	-0.534***
	(-3.00)	(-3.46)	(-3.79)
N. Obs.	117,468	117,468	117,468
Firm-Cat.-Cohort FE	Yes	Yes	Yes
Date-Cat.-Cohort FE	Yes	Yes	Yes

Online Appendix

Table A1. Private Equity Deal Selection

This table presents OLS coefficient estimates from regressing an industry (product category) dummy, a firm selection dummy, and a product selection dummy on explanatory variables to determine the private equity interest in specific product categories, firms, or products. The sample is restricted to months when a private equity deal occurred. The industry selection dummy is equal to one if there was a private equity deal in that product 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 product-category-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	Firm Selection	Product Selection
Herfindal Index	-0.018***		
	(-8.41)		
Price Av. (log)	-0.002***	0.000	-0.000***
	(-3.52)	(0.97)	(-12.53)
Sales (log)	0.001***	-0.001***	-0.000***
	(6.16)	(-3.40)	(-14.90)
Growth N. Products	0.008**	-0.000	
	(2.41)	(-0.86)	
Growth Sales	-0.003*	0.000	-0.000**
	(-1.95)	(1.12)	(-2.30)
Growth Price Av.	0.003	0.000	0.001***
	(0.96)	(0.74)	(9.16)
N. Stores (log)		0.002***	0.001***
		(5.22)	(28.64)
Growth N. Stores		-0.000**	0.000
		(-2.28)	(0.20)
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

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

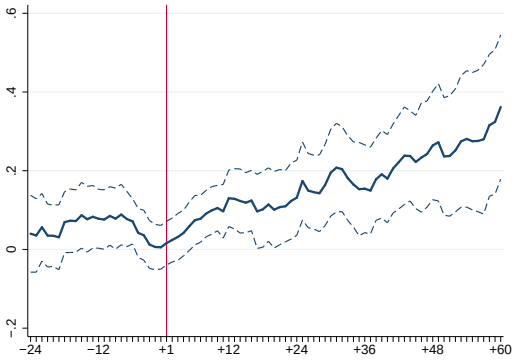
Product Category	Monthly Sales ($)	Av. N. of Products
CIGARETTES	426,500,448	956
SOFT DRINKS - CARBONATED	268,853,056	2,090
CEREAL - READY TO EAT	242,480,576	569
SOFT DRINKS - LOW CALORIE	230,552,880	773
LIGHT BEER (LOW CALORIE/ALCOHOL)	207,623,552	278
WINE-DOMESTIC DRY TABLE	193,224,160	5,055
BAKERY - BREAD - FRESH	187,282,240	2,629
WATER-BOTTLED	177,378,176	1,347
BEER	177,373,424	1,323
TOILET TISSUE	174,232,512	146

Table A3. List of Most Common Private Equity Partners

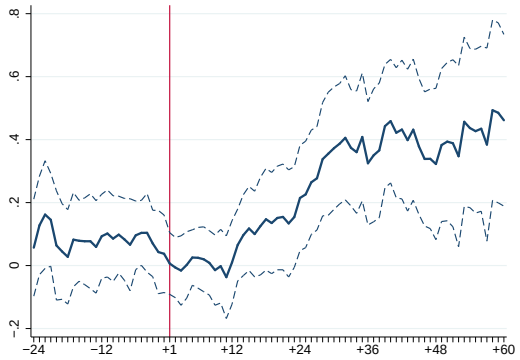
This table shows the most frequent private equity partners that are involved in the 142 private equity deals in our sample.

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

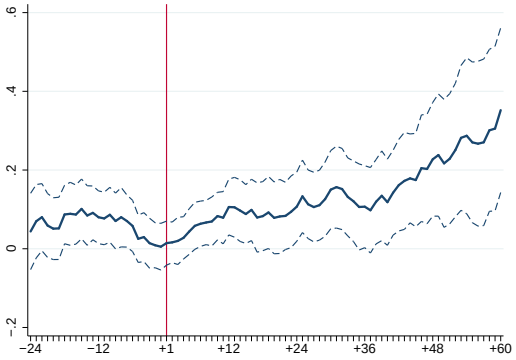
(a) N. of Counties - Within Firm



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

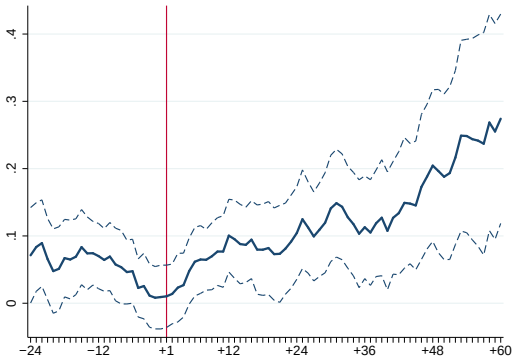


(c) N. of Market Areas - Within Firm



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

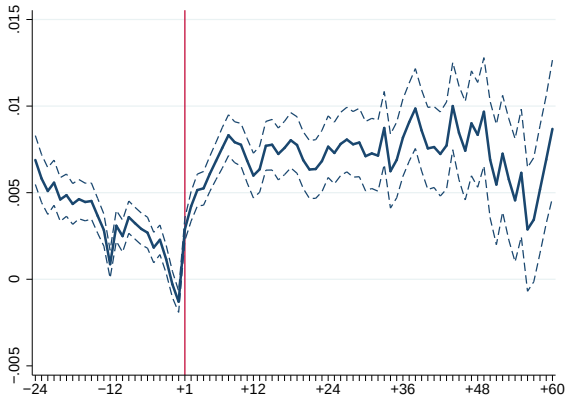
(e) N. of States - Within Firm



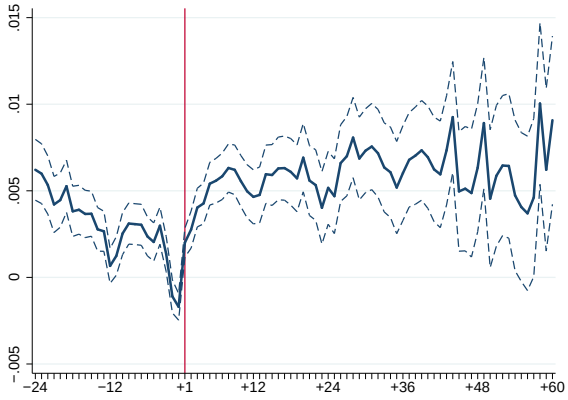
(f) N. of States - Within Firm-Category

Figure A1. Time Trend of Product Availability

These 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 difference in the outcome variables 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 vertical line. The dotted lines show the 90% confidence interval.



(a) Same Retail Chain



(b) Same Designated Market Area

Figure A2. Price Response of Competitors - By Control Type

These figures plot the coefficient estimates of regressions following equation 2, where the dependent variables are product monthly prices. The coefficient estimate at time t represents the difference in the outcome variables between treated products and matched control products, t months away from the date of closing of the private equity deal. This 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 the best match (with the same UPC) but selected from ten random stores where there is no private equity competitor. In Panel (a) we randomly select the ten stores within the same retail chain of the treated product. In Panel (b) we randomly choose the ten stores within the same Designated Market Area 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 vertical line. The dotted lines show the 90% confidence interval. Regressions are estimated using the fixed point iteration procedure implemented by Correia (2014).