

Competitive Effects of Private Equity Investments

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ABSTRACT

In this paper we show that companies receiving private equity (PE) investments outperform their rivals, and we analyze the reasons for this outperformance. Specifically, we find that competitors experience a decrease in their stock price and operating performance around a rival's PE investment, whereas the withdrawal of a previously announced PE investment leads to the opposite outcome (an increase in competitors' stock prices). We identify the underlying sources for the decrease in competitiveness by analyzing the cross sectional differences in competitors' performance. We further find that PE specialization, corporate governance, technological innovation, managerial incentives, and operating efficiency are related to performance differences among competitors at the time of a PE investment. Our results are robust to the inclusion of additional control variables and to a number of alternative explanations. Taken together, our findings support the view that performance differences are driven, at least in part, by the advantages conferred by PE investors.

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Private equity (PE) investments have increased enormously over recent decades. For instance, while total transaction volume was \$192 billion in 2000, it increased to more than \$686 billion in 2007.² Recognizing the importance of such transactions, a growing academic literature has shed light on the performance of companies acquired by PE firms. For example, Jensen (1989) documents the benefits of private equity investors in leveraged buyouts (LBOs), and Kaplan (1989) finds improved operating and cash flow margins and substantial increases in value for management buyout firms. More recently, Guo, Hotchkiss, and Song (2009) find that PE-backed companies show significant increases in stock performance and slight improvements in operating performance after the buyout.³ Analyzing industries into which PE funds have been invested, Bernstein, Lerner, Sorensen, and Strömberg (2010) find that these industries grow more quickly than others.

While the existing evidence points to a positive effect of PE investments, it is far less clear what drives this effect. Yet, as Bernstein, Lerner, Sorensen, and Strömberg (2010) point out, *“it is important to better understand the mechanisms by which the presence of private equity-backed firms affects their peers.”* In this paper we address this question by considering the reaction of rivals to companies that receive investments from PE firms. If PE investments make target companies more competitive, then we should observe a negative reaction in the stock price and operating performance of competitors.⁴ Moreover, competitors should fare less well if their

² Information on aggregate transaction volume comes from reports by Price Waterhouse Coopers (2005) and by IFSL Research (2008; 2009).

³ In addition, private equity is documented to impact other aspects of firms, including technological innovations (Lerner, Sorensen, and Strömberg (2009)) and employment (Davis et al. (2008), Boucly, Sraer, and Thesmar (2009)).

⁴ As documented in the existing literature, e.g. Officer, Ozbas, and Sensoy (2009), we should observe positive announcement returns for PE investment target firms. In unreported results, we verify this pattern in our sample. For example, we find that PE targets have a statistically positive cumulative abnormal return of 4.89% in the 10 day window surrounding the announcement of PE investments.

characteristics make them particularly vulnerable to the competitive advantages driven by PE investments.

To test these conjectures, we begin by examining whether the market views PE investments as positive news by analyzing their competitors' stock price reactions. If PE firms help their target companies compete more successfully against other companies in their industry, then we should expect rival companies to fare less well after the PE investment. The empirical results provide supportive evidence. We first find that competitors observe a decrease in their stock price around the completion of PE investments in their industry, whereas the withdrawal of a previously announced PE investment leads to an *increase* in competitors' stock prices. Moreover, we find that competitors experience a decrease in long-term operating performance following PE investments.

Next, we explore the channels underlying the increases in competitiveness by analyzing cross-sectional differences in competitors' performance. Following existing literature, we identify five possible determinants of the competitive advantage of companies backed by PE firms: PE-firm specialization, own-firm corporate governance, technological innovation, managerial incentives, and operating efficiency. We briefly describe each channel in turn.

We first test for the influence of PE-firm specialization. Gompers et al. (2009) find that, for venture capital firms, their level of specialization has positive effects on target firms. Similarly, Strömberg (2008) finds that, for PE firms, LBO transactions that are sponsored by more experienced PE partnerships tend to stay in LBO ownership for a shorter period of time, are more likely to go public, and are less likely to end in bankruptcy or financial restructuring. Accordingly, after defining a specialization measure, we test whether higher PE-firm specialization leads to more negative consequences for competitors.

Second, we test for corporate governance effects. Acharya, Hahn, and Kehoe (2008) find that PE investments that focus on internal value creation improve margins, and that these deals are often undertaken with active governance initiatives. Kaplan and Strömberg (2008) stress a similar point in their overview paper. We thus test whether the change in corporate governance in PE-backed companies contributes to cross-sectional variation in competitors' reactions.

Third, we analyze the importance of technological innovation. Analysis of this characteristic is motivated by the findings in Lerner, Sorensen, and Strömberg (2009), who show that patents granted to companies involved in PE investments are cited more often after these investments are made.

Fourth, we test for the importance of managerial incentives in explaining the cross-sectional performance of competitors. Leslie and Oyer (2009) document that PE-backed companies use much stronger incentives for their top executives than other firms do. Similarly, Bloom, Sadun, and Van Reenen (2009) survey 4,000 medium-sized firms across Asia, Europe, and the U.S. and find that PE-backed companies are better managed than other types of companies.

Fifth and finally, following the observation in Kaplan and Strömberg (2008) that PE-backed companies become more cost-efficient after PE investments, we test for the impact of operating efficiency on competitors' performance.

The empirical results are consistent with each of these determinants contributing toward the cross-sectional variation in performance around PE investments. In particular, we find that competitors fare better following a rival's PE investment when the target company's PE investor has less industry specialization, and thus expertise, and if the competitors have better corporate governance, are more technologically innovative, have better-aligned managerial incentives, and

are more cost-efficient. These results continue to hold after taking into account control variables that capture a variety of company, market, and industry characteristics. The results are also robust to employing a different definition of competitors. The performance differences among competitors at the time of a PE investment thus appear to be closely linked to those factors associated with PE target firms' performance. This linkage supports the view that performance differences are driven, at least in part, by the advantages given to target firms by PE investors.

In additional analyses we control for several alternative explanations. In particular, we test for the effects of five additional factors, which we refer to as *Private Equity Investment Premium*, *Company Visibility*, *Industry Visibility*, *Financial Strength*, and *Deep Pockets*. While we find evidence consistent with several of these hypotheses, especially *Company Visibility* and *Financial Strength*, none of these factors eliminate the competitive effects of PE investments that we document.

The main contribution of this paper is to identify a number of channels through which PE investments affect performance. Our analysis shows that competitors' performance is closely linked to the five channels we consider, and thus these channels help answer the important question raised by Bernstein, Lerner, Sorensen, and Strömberg (2010) of how PE investments affect the performance of their peers.

The rest of the paper is organized as follows. In Section I, we develop our testable hypotheses. Section II describes the data and sample selection. Section III presents results of our main analyses as well as robustness tests, and Section IV examines possible alternative explanations. Section V concludes.

I. Hypothesis Development

We analyze how a PE investment in a target company affects the performance of competing companies in the same industry. Competitors' performance can be measured in different ways. In what follows we develop several hypotheses that form the basis for our empirical analyses.

Our first set of hypotheses relates to how competing firms' stock prices react to PE investments in rival firms (i.e., firms in the same industry). While PE investments are often announced some time before the actual completion of the investment, there is substantial uncertainty at the announcement date about whether the investment will in fact be completed. Thus, we expect both the PE announcement and its subsequent completion or withdrawal to have an impact on competitors' stock returns.

Our main hypothesis on stock price effects is as follows:

HYPOTHESIS 1 (Short-term Price Reaction): The stock prices of publicly traded firms react to PE investments in their industry.

Hypothesis 1 leads to three testable implications. First, because a PE investment is expected to increase the target firm's competitive advantage, the successful completion of a PE investment should have a negative impact on competitors' stock prices:

HYPOTHESIS 1a (Returns around a Completed PE Investment): The completion of a PE investment has a negative price impact on publicly traded competitors.

Second, if it is bad news for rival firms to face a completed PE investment in their industry, it should be good news for these firms if an expected PE investment does not go through:

HYPOTHESIS 1b (Returns around a Withdrawn PE Investment): The withdrawal of a PE investment has a positive price impact on publicly traded competitors.

Third, given the initial announcement of a PE investment increases the likelihood that a PE target will eventually become more competitive, rivals' returns should be decreasing following the announcement of a PE investment:

HYPOTHESIS 1c (Returns around the Announcement of a PE Investment): The announcement of a PE investment has a negative price impact on publicly traded competitors.

Notice that the initial PE announcement is the earliest point in time information on a PE investment is available, and thus the first event that can be used for an event study analysis. Such analysis can be conducted for both PE investments that will eventually succeed and PE investments that will eventually be withdrawn.

Related to the first set of hypotheses, our second hypothesis posits that a PE investment in a target is also expected to have a negative impact on competitors' long-term operating performance:

HYPOTHESIS 2 (Long-term Operating Performance Reaction): A PE investment has a negative impact on publicly traded competitors' long-term operating performance.

To summarize so far, Hypotheses 1 and 2 focus on companies' short-term price reaction and long-term operating performance following a PE investment in a rival firm. Our third, and final, set of hypotheses focus on variations in these reactions across firms. Based on existing literature, we expect several factors to have an effect on the cross-sectional variation in competitors' performance.

Our main hypotheses on cross-sectional differences among competitors, as well as the related hypotheses on the underlying determinants of these differences, are as follows:

HYPOTHESIS 3 (Cross-sectional Differences Among Competitors): Competitors show cross-sectional differences in their reactions to PE investments in their industry, with the differences a function of PE investor as well as own-firm characteristics.

HYPOTHESIS 3a (PE Investor Specialization): Rivals' performance after PE events is decreasing in the degree of specialization of target firms' PE investors.

HYPOTHESIS 3b (Corporate Governance): Rivals' performance after PE events is increasing in the quality of own-firm corporate governance.

HYPOTHESIS 3c (Managerial Incentives): Rivals' performance after PE events is increasing in the degree of own-firm managerial incentive alignment.

HYPOTHESIS 3d (Technological Innovation): Rivals' performance after PE events is increasing in the degree of own-firm technological innovation.

HYPOTHESIS 3e (Operating Efficiency): Rivals' performance after PE events is decreasing in the level of own-firm operating efficiency.

In the robustness section (Section IV), we extend our analysis by developing and testing alternative hypotheses for our results.

II. Data, Sample Selection, and Descriptive Statistics

In this section we discuss our data source for PE transactions in Subsection A, our sample of PE transactions used to investigate industry competitors' short-term stock price reactions in Subsection B, and our sample of PE transactions used to study industry competitors' long-term operating performance following PE investments in Subsection C. Subsection D discusses selection of industry competitors and data sources for other variables used in our empirical tests are discussed in Subsection E. We present descriptive statistics in Subsection F.

A. PE Transactions: Data Source

We obtain data on PE transactions from the Capital IQ Database. This database provides two main advantages. First, Capital IQ provides comprehensive coverage of PE investments, especially after 1999.⁵ Second, Capital IQ uses the Global Industry Classification Standard

⁵ See Strömberg (2008) and Lerner, Strömberg, and Sorensen (2009) for further discussions on the Capital IQ database.

(GICS). According to Bhojraj, Lee, and Oler (2003), GICS is a better industry classification than either SIC or NAICS in explaining key financial ratios and thus is well suited for the study of the effect of PE investments on industry competitors.

B. Sample of PE Investments for Short-term Analyses

To analyze the short-term effect of PE investments on industry competitors, we select a comprehensive sample of PE investments from the Capital IQ database. The selection criteria are as follows: (1) the buyer of the M&A transaction is categorized as “private equity investor”, (2) the value of the transaction is greater than 10 million dollars, and (3) the transaction is in the United States or Canada and is announced between 1980 and 2008. These selection criteria result in a sample of 13,468 completed and 212 withdrawn PE investments in 68 six-digit GICS industries.⁶ Among the sample of 13,468 completed PE investments, 13,087 have daily stock return data available in CRSP. Thus, we analyze industry competitors’ short-term price reactions for 13,087 completed and 212 withdrawn PE investments.

C. Sample of PE Investments for Long-term Analyses

In the sample of PE investments used in the short-term analyses, it is often the case that more than one PE investment occurs in a given industry-year. This creates an issue when we study the long-term effects of PE investments on targets’ publicly traded competitors: the results could be contaminated by the impact of other PE investments in the same industry. To illustrate, assume we are examining the reaction to a relatively small PE investment. If a larger PE investment occurs during our measurement period, the effect of our chosen event on industry

⁶ Bhojraj, Lee, and Oler (2003) also identify industries based on six-digit GICS codes.

competitors would be contaminated by the effect of the larger PE investment. It is therefore important to identify PE investments with the lowest potential for contamination.

To mitigate the potential for contamination, we follow the rolling window selection method proposed by Hsu, Reed, and Rocholl (2010) and limit attention to those PE investments not preceded or followed by a larger PE investment in the same industry in the surrounding six years. We use a PE investment's transaction value as the measure of investment size. Following this selection criterion, we obtain a sample of 178 PE investments.

The advantages of the rolling window selection procedure include maximum use of the data, which allows us to use all PE investments that have a minimally contaminated measurement period, and a reduction in the bias that arises from the selection of PE investments based on arbitrarily defined periods of time. As Figure 1 shows, the PE investments chosen using this method are located relatively evenly across the sample years, with at most 24 PE investment events in any given sample year.

D. Industry Competitors

Our initial sample of competitor firms comprises firms in the same six-digit GICS industry as a PE investment's target firm.⁷ We further restrict competitor firms to those that were publicly listed at least three years before the PE investment event year so that we can clearly observe differences in performance before and after the PE investment event.

⁷ In Section III, we show that the main results are robust to alternative definitions of competitors.

E. Other Data

We obtain accounting information on both PE investments and industry competitors from Compustat. We obtain competitors' entrenchment index from Lucian Bebchuk's website.⁸ To calculate the sensitivity of competitor executives' wealth to stock price, we obtain executive compensation data from Execucomp. Finally, data on competitors' patents and citations come from the NBER Patents and Citations Database. Table I presents the definitions of the variables used in this paper.

F. Descriptive Statistics

Table II, Panel A reports descriptive statistics for the 178 PE investments used in the long-term analyses. The panel shows that the mean transaction value for these PE investments is 3.38 billion dollars, reflecting the sample selection criterion that focuses on PE investments that are large relative to other industry PE investments. The panel also shows that 88.76% of this sample of PE investments, that is, the vast majority, are mergers and acquisitions, while the remaining 11.24% are private placements. In addition, only 63 of the 178 PE targets (35.39%) are public at the time of the PE investment. Of the 63 public PE targets, 23 (36.51%) are going private transactions, 14 (22.22%) are private investments in public equity (PIPE), and the remaining 26 (41.27%) are those transactions for which delisting dates are unavailable in CRSP.⁹ Finally, Panel A reports statistics on the industry specialization of the 178 target firms' PE investors. The average specialization ratio, which is the ratio of PE investors' prior industry investments divided by total prior investments, amounts to 7.34%.

⁸ See <http://www.law.harvard.edu/faculty/bebchuk/data.shtml>.

⁹ Going private transactions are defined as those public PE targets delisted within 30 days before and after the closed date, and the delisting reasons are mergers and acquisitions (CRSP delisting codes between 200 and 300). PIPE transactions are those PE targets that remain public after the closing dates.

Panel B reports descriptive statistics for the industry competitor firms. In particular, summary statistics are provided for firm age, firm size, the Herfindahl index, and four variables that measure the underperformance of industry competitor firms around PE investments: corporate governance, managerial incentives, technological innovation, and operating efficiency.

III. Empirical Results

In Section I we develop three sets of hypotheses on the impact of PE investments. We test these hypotheses in this section. We first analyze competitors' short-term price reactions to PE investments in Subsection A. We next examine changes in competitors' long-term operating performance before and after PE investments in Subsection B. In Subsection C we examine multivariate regressions in which we control for a variety of company, market, and industry characteristics. In Subsection D we examine potential determinants of variation in competitors' reactions to PE investments. Finally, in Subsection E we examine the robustness of our results to an alternative definition of competitor firms.

A. Short-term Price Reaction

Hypothesis 1 states that the stock prices of publicly traded firms react to PE investments in their industry. Figure 2 depicts companies' cumulative abnormal returns (CARs) around a PE investment in their industry. The figure shows that competitors' stock prices exhibit negative abnormal returns over the 15 days before the announcement or completion of a PE investment. Stock prices following the announcement or completion of a PE investment exhibit a similar trend, with competitors' average CAR equal to -1.5% 20 days after the announcement or completion. In contrast, for withdrawn PE investments, competitors' stock prices show no

particular trend until 10 days before the withdrawal, at which point they exhibit a positive response until 20 days after the withdrawal. This figure provides initial evidence that PE investments lead to stock price reactions for industry competitors. We test this hypothesis more formally below by analyzing the CARs associated with the different types of events (completed PE investments, withdrawn PE investments, and PE investment announcements) for different event windows.

A.1 Returns around Completed PE Investments

Hypothesis 1a posits that the completion of a previously announced PE investment leads to negative stock returns for industry competitors. We test this hypothesis by analyzing the market-adjusted stock returns of competitors around the completion of 13,087 PE investments over the 1980 and 2008 period. Panel A of Table III presents the average stock market returns for different event windows, which start five days before the completion date and end one to 20 days after the completion date. As the returns of companies in a given industry might be correlated around a PE investment in their industry, we form portfolios of the competitor companies for each PE investment, we calculate the portfolio return for each PE investment, and then we average the portfolio returns across PE investments. The results suggest that competitors' returns are decreasing around the completion of PE investments in their industry: the CAR for competitors is negative and statistically significant at the 1% level for each event window. For instance, the CAR for the shortest window we consider, the (-5, 1) CAR, is -0.28% and statistically significant at the 1% level. The CARs decrease monotonically with the length of the event window, reaching -1.40% for the window between five days before and 20 days after the

event. These results support Hypothesis 1a and suggest that competitors experience a decrease in their stock price around the completion of PE investments in their industry.

A.2. Returns around Withdrawn PE Investments

Hypothesis 1b posits that, in contrast to the completion of a PE investment, the withdrawal of a previously announced PE investment leads to positive stock returns for industry competitors. We identify a total of 212 withdrawn PE investments and use the same methodology as for completed PE investments to analyze the stock returns of competitors around these withdrawals. The results are reported in Panel B of Table III and show that competitors experience positive stock price responses when PE investments are withdrawn. This pattern holds for each of the analyzed event windows, with the returns statistically significant at the 10% level or better for each window except the longest one. Withdrawal stock returns thus show a pattern opposite to the stock returns of competitors in industries with completed PE investments. These results are consistent with Hypothesis 1b and suggest that competitors benefit if an initially announced PE investment in their industry is withdrawn.

A.3 Returns around the Announcement of PE Investments

Hypothesis 1c refers to the announcement of a PE investment. Because an announced PE investment can subsequently be completed or withdrawn, the announcement of a PE investment is expected to have a similar impact on competitors' stock prices as its completion, since an announcement significantly increases the likelihood that companies in a given industry will face greater competition from a rival backed by a PE investor. We test this hypothesis by analyzing the returns of competitors around the announcement of a PE investment in their industry. The

results, which are presented in Panel C of Table III, are consistent with Hypothesis 1c. Competitors' event returns are negative and statistically significant at the 1% level for each of the observed event windows, ranging from -0.21% for the shortest event window we consider (i.e., (-5, 1) CAR) to -1.40% for the longest event window we consider (i.e., (-5, 20) CAR). Taken together, these results provide evidence that the returns of competitors around the announcement of a PE investment are negative.¹⁰

In summary, the results from our short-term analyses suggest that, consistent with Hypothesis 1, companies that are backed by a PE investor can successfully compete against their competitors. In the next section, we consider the effect of PE investments on competitors' long-term operating performance.

B. Long-term Operating Performance

The evidence above suggests that the market views a PE investment in a company as bad news for the company's competitors, as reflected in a decrease in competitors' stock price. Hypothesis 2 states that we should expect a similar decrease in the operating performance of these competitors. To analyze competitors' operating performance we follow key performance variables eight quarters before and eight quarters after the PE investment. The results are presented in Table IV and suggest that competitors do indeed experience a decrease in operating performance. In particular, return on assets (ROA), asset growth, sales growth, operating income growth, R&D growth, the market-to-book ratio (M/B ratio), the Kaplan and Zingales financial constraint index (K-Z), and the leverage ratio each exhibit a negative trend following a PE

¹⁰ In an unreported test, rather than analyzing industry competitors' CARs around announcement and completion dates using the full sample of PE investment events, we analyze these CARs using 178 PE investment events identified by the 6-year rolling window selection mechanism. We continue to find that industry competitors experience significantly negative stock returns around these event dates.

investment in their industry. For example, ROA decreases from 2.46% before the PE investment to 2.26% afterwards, asset growth decreases from 1.40% to 0.99%, and the market-to-book ratio decreases from 1.83 to 1.69. These results suggest that the financial flexibility of competitors decreases following a PE investment in a rival firm. In sum, these results support Hypothesis 2 and suggest that competitors' operating performance is negatively affected by PE investments in the competitors' rival firms.

C. Multivariate Results

The univariate results in Subsections A and B suggest that PE investments affect industry competitors' short-term stock returns as well as long-term performance, but one might question whether other factors may explain these results. To address this question, we look at performance over time to determine whether performance declines are significantly affected by PE investments even after controlling for a number of factors known to predict performance. Our approach is to model performance as a function of firm size, firm age, industry valuation, and past performance. Specifically, we estimate the following panel regression:

$$Performance_{i,t} = \alpha + \beta * PE\ Event_{i,t} + \gamma * controls_{i,t} + \varepsilon_{i,t} \quad (1)$$

In this regression, $Performance_{i,t}$, for each firm i in year t is taken to be one of the following seven proxies for industry competitors' performance: (1) the log of annual stock returns, (2) the log of annual abnormal returns where the benchmark is based on the Fama-French three-factor model, (3) the log of M/B ratio, (4) sales growth, (5) operating income growth, (6) capital expenditures growth, and (7) R&D growth. The indicator variable $PE\ Event_{i,t}$

is equal to one if year t is within a three-year period starting with a PE investment in firm i 's industry and zero otherwise. The sample comprises as many years as possible for each firm. We thus have a panel regression in which each firm has data from both PE investment years and non-PE investment years. We estimate the model using industry fixed effects.

In Table V we see that performance is significantly affected by control variables such as age, size, and the market-to-book ratio. For example, in Model 4 older firms perform worse than younger firms, as indicated by the negative coefficient on the age variable. Turning to our main variable of interest, the PE event indicator, we find that for each measure of performance, PE investments reduce performance. In particular, in Model 1 we see a statistically significant 9.5% decrease in log returns in PE event years, and in Model 2 we see a statistically significant 3.2% decrease in log alpha. We find a statistically significant 2.3% decrease in log market-to-book in Model 3 and a statistically significant 1.6% decline in sales growth in the years in which a large PE investment occurs in the firm's industry in Model 4. Similarly, operating income growth declines by a statistically significant 2.3% in PE investment years (Model 5), capital expenditure growth declines by a statistically significant 4.9% in PE investment years (Model 6), and R&D growth declines by a statistically significant 2.4% in PE investment years (Model 7). Overall, these results show that measures of performance based on firm profitability continue to show a decline in PE investment years after taking into account a firm's age, size, and industry valuation.

D. Cross-sectional Differences among Publicly Listed Firms

The previous section establishes that PE investments lead to significant performance deterioration for competitors, even after controlling for factors that otherwise affect performance.

In this section, we investigate whether declines in performance in PE investment years are related to competitive advantages specific to PE target firms. In particular, we test Hypothesis 3 and analyze whether cross-sectional differences in PE-period competitors' performance can be explained by five previously recognized factors influencing PE performance: PE-firm specialization and own-firm corporate governance, managerial incentives, technological innovation, and operating efficiency. Specifically, we run the following cross-sectional regression:

$$\begin{aligned}
 Performance_{i,e} = & \alpha + \beta * specialization_{i,e} + \gamma * governance_{i,e} + \delta * incentives_{i,e} \\
 & + \theta * innovation_{i,e} + \upsilon * efficiency_{i,e} + \zeta * controls_{i,e} + \varepsilon_{i,e}
 \end{aligned} \tag{2}$$

In our first specification of regression (2), we measure performance as the cumulative abnormal stock returns of industry competitors from five days before to 10 days after the announcement of PE investment event e . We test our five hypothesized determinants of performance using measures of specialization, corporate governance, managerial incentives, technological innovation, and operating efficiency around the time of each PE event. In contrast to the approach used to test Hypotheses 1 and 2, this cross-sectional test uses only one observation per firm in order to capture any cross-sectional patterns in abnormal performance around PE events. In what follows, we discuss the results for each of the hypothesized determinants of performance separately. All of the results are reported in Table VI.

DI. Specialization

One of the potential mechanisms behind poor competitor performance is the degree of PE investors' specialization. Gompers et al. (2009) find that VCs' level of specialization has

positive effects for target firms. Similarly, Cressy, Munari, and Malipiero (2008) find that firms backed by more specialized PEs show significantly greater operating performance. Given these findings, we conjecture that if PE investments do indeed augment target firms' competitiveness, then the decrease in competitor performance around a PE investment should be linked to the PE investor's level of specialization. To test this hypothesis, we define *PE Specialization* as the ratio of the number of PE investors' prior industry investments divided by the total number of PE investors' prior investments, as proposed by Gompers et al. (2009).

In Model 1 of Table VI, we find a negative and statistically significant coefficient of -0.0549 on *PE Specialization*, which indicates that competitors have significantly weaker performance when PE investments in their industry are announced by more specialized PE firms. The fact that more specialized PE investments lead to greater deterioration in competitor performance than less specialized investments is consistent with Gompers et al. (2009) and Cressy, Munari, and Malipiero (2008), and indicates that PE-firm specialization is one of the factors underlying the observation that PE target firms perform better than their competitors.

D2. Corporate Governance

Acharya, Hahn, and Kehoe (2008) and Kaplan and Strömberg (2008) find that PE investments with higher alpha and higher margin growth are associated with greater intensity of PE firm engagement, contributing to more performance increases for better governed firms around the time of PE investments. To test whether corporate governance plays a role in competitors' performance around PE investments, we use the E-index, which is the entrenchment index of competitors measured nearest to the announcement date of PE investments (Bebchuk, Cohen, and Ferrell (2009)).

In Model 2 of Table VI we find a statistically significant coefficient estimate of -0.0023 on the E-index, indicating that industry competitors with better corporate governance perform better than other firms following PE investments. This result is consistent with the view that, as described in Acharya, Hahn, and Kehoe (2008), PE investments in better governed firms are associated with greater intensity of engagement of PE firms.

D3. Managerial Incentives

Leslie and Oyer (2009) document that PE-owned firms use much stronger incentives for their top executives. Bloom, Sadun, and Van Reenen (2009) further find that PE-backed firms are better managed than government, family, and privately owned firms. Based on this evidence, we conjecture that managerial compensation is an important determinant of competitors' decline in performance following PE investments. To test for such an effect, we follow Core and Guay (1999) and measure the sensitivity of executives' stock and option values to changes in competitors' stock prices in the year of the PE investment.

In Model 3 of Table VI we find a statistically significant coefficient estimate of 0.0037. This indicates that competitors with compensation packages that are more sensitive to share prices perform better than other firms following a PE investment in a rival firm. This result is consistent with the view that, as described in Leslie and Oyer (2009), the outperformance of PE investment targets is partly due to more incentive-based compensation.

D4. Technological Innovation

Lerner, Sorensen, and Strömberg (2009) find that patents granted to firms involved in PE transactions are cited more after PE transactions, indicating that PE investments may improve the

effectiveness of technological innovation. We test whether this improvement contributes to the performance declines of PE targets' competitors by measuring the cumulative number of citations received from the patents granted to firms before the PE investment event.

In Model 4 of Table VI we find a statistically significant coefficient estimate of 0.0023, which indicates that competitors with fewer patent citations experience larger performance declines around the time of the PE investment. This result is consistent with the view that PE investors improve technological innovation.

D5. Operating Efficiency

Our last hypothesized determinant of performance around PE investments is based on Kaplan and Strömberg (2008), who suggest that PE investments may contribute to increases in operating efficiency. To test whether operational efficiency improvements play a role in the performance of competitors, we use the ratio of cost of goods sold (COGS) to sales.

In Model 5 of Table VI we find a statistically significant coefficient estimate of -0.0001. This result indicates that competitors with better operational efficiency perform better than other firms, and are consistent with the view that a decrease in operational efficiency leads competitors' relative performance decreases following a PE investment to be more pronounced.

Models 6, 7 and 8 of Table VI present results for multi-hypothesis models in which various determinants studied above are included simultaneously. Of our five hypothesized determinants of competitive advantages, technological innovation is relatively weak compared with the others; the coefficient on patent citations is insignificant in Table VI, Model 8. In contrast, the results on specialization and governance are particularly strong in the multi-hypothesis model, with a coefficient estimates that are significant at the 1% level.

Table VII presents results of analyses similar to Table VI except that we replace cumulative abnormal returns with changes in market value. The results are largely unchanged and thus for brevity we do not discuss them here.

E. Robustness to Definition of Competitors

In our analysis so far, we define competitors as those publicly listed firms that operate in the same six-digit GICS industry as the PE target. To test the robustness of our results to this definition, we repeat our analysis using an alternative sample selection, namely, the firms listed in Capital IQ as competitors based on target firms' annual reports.¹¹ Using this database we obtain data for 11,835 rivals around the completion dates of 3,073 PE targets; rivals for 3,041 of these targets have CRSP data. We also obtain data for 500 rivals around the withdrawal dates of 103 PE targets; rivals for 93 of these targets have CRSP data. Finally, we obtain data for 13,221 rivals around the announcement dates of 3,427 PE targets; rivals for 3,391 of these targets have CRSP data.

In the analysis, which we do not report, we find that the short-term reactions for the three events (completion, withdrawal, and announcement) are very similar to those reported in Table III. In particular, competitors' abnormal returns are still negative and significant around the completion and announcement of a PE investment, while they are positive (but – probably due to the small sample size – fail to be significant) around the withdrawal of a PE investment. Our results are thus generally robust to a different definition of competitors, in particular, the set of competitors indicated in the target firms' annual reports.

¹¹ For public companies, the Capital IQ database lists competitors that are identified in a company's annual report. Capital IQ also identifies competitors for private companies.

IV. Alternative Explanations

In this section, we explore alternative hypotheses for the results in our paper. Specifically, we examine whether the following five factors explain our results: *Private Equity Investment Premium*, *Company Visibility*, *Industry Visibility*, *Financial Strength*, and *Deep Pockets*. Notice that these hypotheses are not mutually exclusive either with each other or with our main hypotheses.

In sum, we find evidence consistent with several of these factors contributing to our results, but none of these alternative hypotheses eliminates the competitive effect of PE investments that we document above.

A. Private Equity Investment Premium

One of the key findings in our paper is that competitors' stock prices decline after announcements of PE investments. One alternative explanation for this result could be as follows. Suppose a PE investor considers a sample of companies for her investments. This investor anticipates that there will be a PE investment in one of those companies, with stock price appreciation in that company when the investment is announced. This would lead to stock price increases in each of the potential targets before the selection and announcement of the specific target. Upon the target's selection and announcement, the stock price for the target company would increase further, as it would become clear that the premium is relevant for that company, while the stock prices of the other companies, which are not selected, would decrease.

We test this hypothesis by following the stock prices of targets and competitors around PE investments. If the PE investment premium hypothesis is true, we would expect to see a positive alpha for the potential set of targets before the announcement. We find, however, that

alpha (measured six months before the announcement) is indistinguishable from zero both for the 6-digit GICS industry classification used in the main analysis (0.52% with a t-stat of 1.34) and for the Capital IQ classification introduced in the previous subsection (0.74% with a t-stat of 0.62). Further, if this hypothesis is true, then we would expect the industry alpha before the announcement to be negatively correlated with the industry (ex-target) alpha after the announcement. We do not find supportive evidence for this effect either: the correlation is indistinguishable from zero for both the 6-digit GICS classification (0.0941 with a p-value of 0.2113) and the Capital IQ classification (-0.05375 with a p-value of 0.6706). These figures suggest that the results in our paper are not driven by the PE investment premium hypothesis.

B. Company Visibility

PE investors collect information on potential target firms and reveal this information by selecting one specific target firm. Since there is good reason to think that markets are not perfectly efficient with respect to small firms, the selection of a small target may increase the visibility, and therefore stock price, of the target firm (e.g., Bushee and Miller (2007)). Likewise, the resulting stock price reactions could be seen as a signal about the relative potential of several competing companies. To test this hypothesis we re-run the analyses in Table V and VI including the dummy variable *Analyst Coverage*, which following Cliff and Denis (2004) takes a value of one if a rival firm has coverage and zero otherwise. We expect the increased visibility of PE investment selection to be less important if other information on a given firm is publicly available, as for example through analyst coverage. The results are presented in Tables VIII and IX.

In Table VIII, we see that for $\text{Log}(1+\text{Ret})$ and Sales Growth as our dependent variables, and the coefficients for the PE event dummy variable are almost identical to those in Table V. When we include Analyst Coverage in the analysis, the coefficient estimate is insignificant in most models. There are two exceptions, however: $\text{Log}(1+\text{alpha})$ and $\text{Log}(M/B)$. In both cases analyst coverage is statistically positive, indicating that analyst coverage contributes to increased market valuations, as would be expected from a visibility story such as in Bushee and Miller (2007). However, while visibility does play a significant role in some cases, for the purposes of this paper the key insight from Table VIII is that the PE event dummy for PE transactions remains negative and significant in each of the seven models. Turning to Table IX, where we extend Table VI with the additional control variables, we find that as with the previous results, including Analyst Coverage does not alter the evidence in support of the hypothesis that PE investments cause decreases in competitors' performance.

C. Industry Visibility

PE investors may also think about the potential of industries as a whole, so that the selection of a particular industry by a PE investor can again be seen as increasing the visibility of that industry. We test this hypothesis by including in the analysis a variable that measures the fraction of firms that have analyst coverage in each six-digit GICS industry, $\% \text{ of Firms with Analyst Coverage}$. We again expect increased visibility to be less important if other information sources are available. The results of this test are also provided in Tables VIII and IX.

In Table VIII, we see that $\% \text{ of Firms with Analyst Coverage}$ has a negative effect on $\text{Log}(1+\text{Ret})$, which indicates that, contrary to the hypothesis, industries with higher visibility have lower returns. Similarly, Table VIII shows industries with higher visibility have lower

abnormal returns (Model 2) and lower valuations (Model 3). When we turn to the short-term results in Table IX, we see that industry visibility makes no significant difference in returns. Overall, we find no strong support for the industry visibility hypothesis, and controlling for industry visibility doesn't weaken the support for our main hypothesis.

D. Financial Strength

In line with the financial constraints argument examined in Chevalier (1995) and Phillips (1995), our next hypothesis posits that PE targets may fare better than their competitors as their financial position benefits from the equity capital that is injected by PE investors. We test this hypothesis by including in the analysis the variable *Cash/Assets*, which following Fresard (2010) we construct for each competitor as the ratio of cash to assets. We again present the results of this test in Tables VIII and IX.

In Table VIII, we see that *Cash/Assets* has a negative effect on $\text{Log}(1+Ret)$, which indicates that, contrary to the hypothesis, competitors with lighter financial constraints are less competitive. On the other hand, *Sales Growth* shows a positive and significant effect. Similarly, the effect is positive and significant for $\text{Log}(M/B)$, *Capex Growth*, and *R&D Growth*, lending some support to the existence of a financial constraints effect. Turning to the short-term results in Table IX, we see that *Cash/Assets* has no significant effect in returns. In sum, we find weak support for the financial strength hypothesis in the data. Again, however, controlling for this hypothesis does not appear to weaken the support for our main hypotheses.

E. Deep Pockets

Our last hypothesis conjectures that PE targets may outperform their industry competitors to the extent that their investors have deep pockets, which could be accessed in the future when additional financing needs arise.¹² We test this hypothesis by using the number of PE investments made by all of the target's PE investors in the year before the announcement, a variable we call *Fund Size*. Note that for empirical evidence on this hypothesis, we cannot look at Table VIII because there is no cross-sectional variation in *Fund Size* for a given PE investment event. However, we can look at the short-term results in Table IX, where we see that *Fund Size* has no measurable effect on short-term performance. Thus, we find no direct support for the deep pockets hypothesis. Further, we again find that controlling for this factor does not affect the evidence on our main hypothesis.

On balance, the evidence in this section suggests that there is some support for the alternative hypotheses we consider, especially *Company Visibility* and *Financial Strength*. However, these hypotheses are not mutually exclusive with respect to our main hypotheses, and for the purpose of this paper the key result of this section is that the main explanatory variables retain their significance and thus are robust to consideration of these alternative explanations.

V. Conclusion

In this paper we analyze companies' reactions to PE investments in rival firms. We find that, consistent with the hypothesis that competitors' stock price reactions capture the improved competitiveness of the PE target, competitors experience a decrease in stock price around PE investment announcements and subsequent completions, whereas they experience an increase in

¹² We thank our discussant at the second ESSEC Private Equity Conference for this suggestion.

stock price around PE investment withdrawals. Moreover, competitors experience a decrease in long-term operating performance following PE investments.

We next examine whether cross-sectional differences in competitor performance can be explained by five previously recognized factors influencing PE performance: specialization, corporate governance, managerial incentives, technological innovation, and operating efficiency. We find that competitors fare better when the PE investor in the target company has less industry specialization and if the competitors have a better system of corporate governance, more technological innovations, better-aligned managerial incentives, and better operating efficiency. We thus find that performance differences among competitors around PE investments are closely linked to factors associated with PE target firms' performance, giving support to the hypothesis that performance differences are driven by the advantages conveyed to target firms by PE investors.

These results suggest that PE investments have competitive effects in the targets' industries. This evidence should be of interest to different agents including investors, target firms, and their competitors. For investors, it has implications for the assessment of the expected risk and return of companies in industries in which there is a high probability of new PE investments. For target firms, it has implications for the choice of different available financing sources. Finally, companies that are in the same industry as a PE target firm can use these results to understand how rivals' PE investments affect their competitive position.

The results in this paper should also be of interest to researchers, particularly those interested in the performance of PE funds. Kaplan and Schoar (2005) find strong persistence in the returns of PE funds; in cross-sectional analysis, they find that PE fund performance increases

with fund size and with general partners' experience.¹³ The results of this study suggest a potential source of the superior performance of experienced PE funds, namely, the portfolio companies into which more experienced PE investors invest have more competitive advantages in the product market.

More research is called for to examine the link between the product market competitiveness of PE investments and PE investors' performance. More generally, it should be a promising avenue for future research to better understand the link between different means of financing and product market competitiveness as well as companies' related strategic considerations in securing certain sources of financing.

¹³ Lerner, Schoar, and Wongsunmai (2007) also find that PE funds with more experienced limited partners (LPs) exhibit better fund returns.

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Figure 1
The Time Distribution of 178 Rolling-window Private Equity Investments

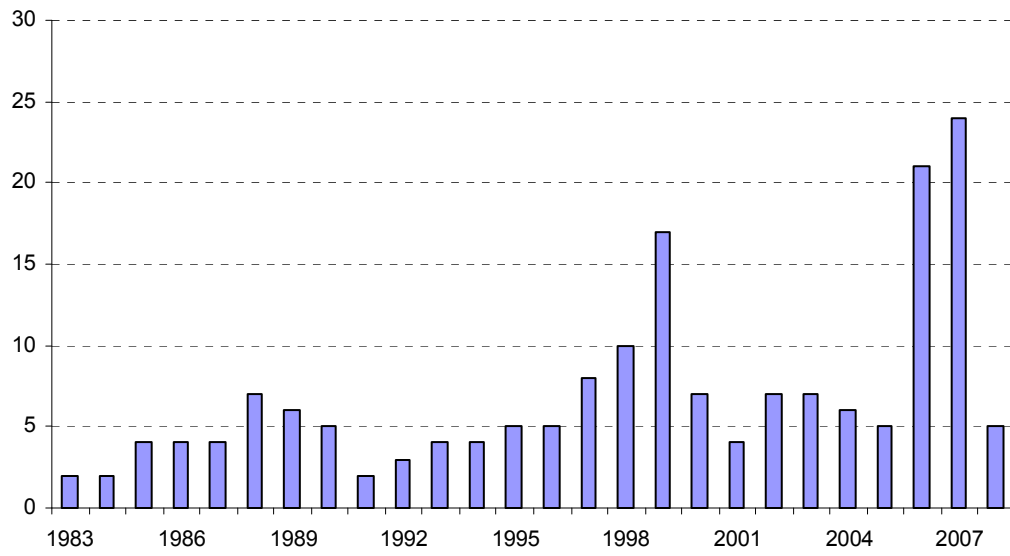


Figure 2
Industry Competitors' CARs around the Announcement, Completion, and Withdrawal of PE Investment Events

The sample private of equity investments include 13,299 investments. Among the 13,299 investments, 13,087 were later completed and 212 were later withdrawn. Incumbent firms share the same six-digit GICS industry as the PE investment events. The timeline (in days) around the PE investment event is shown on the x-axis, where date zero depicts the announcement date. The cumulative abnormal return (CAR) on the y-axis is the value weighted market model excess return (in %) across each firm in a PE investment event industry.

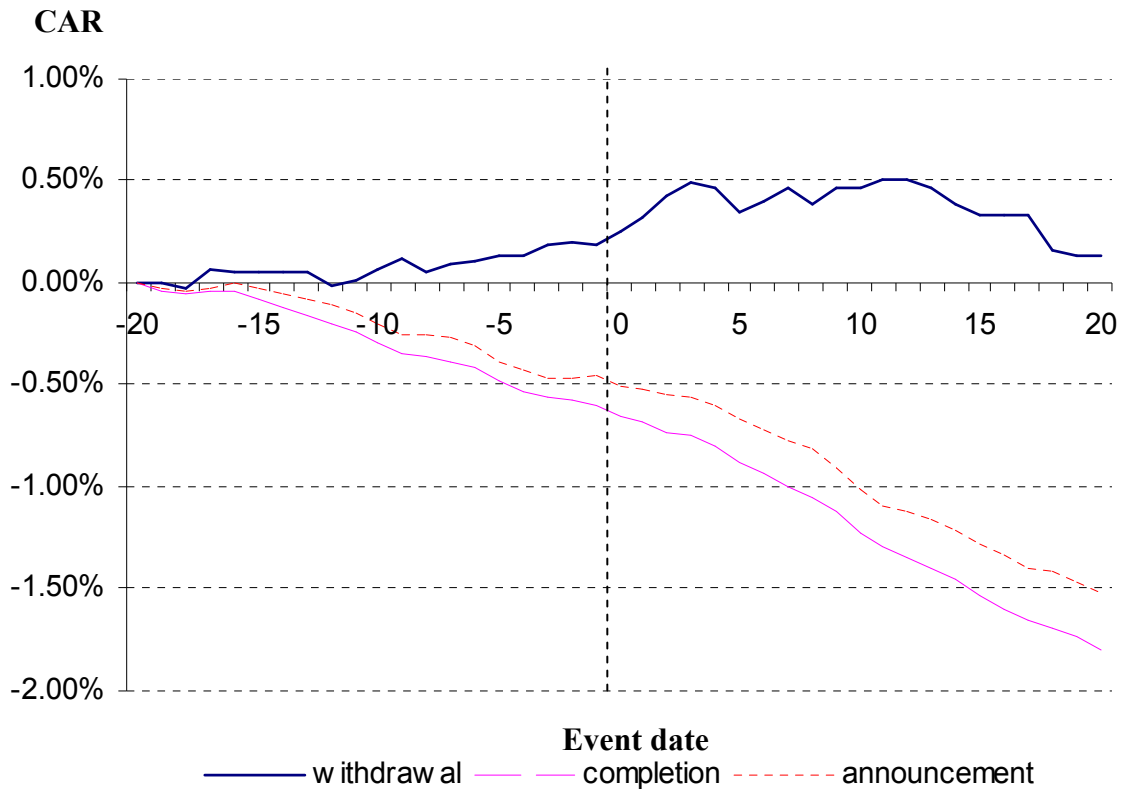


Table I
Variable Definitions

Variable	Definition
(1) Firm age since founding	The age of the firm from the founding date to the announcement date of the PE transaction.
(2) Specialization ratio of PE investors	the ratio of the number of PE investors' prior industry investments divided by the total number of PE investors' prior investments, as proposed by Gompers, Kovner and Lerner (2009).
(3) Asset	Book value of assets.
(4) Sales	Book value of sales.
(5) Firm age since trading	The age of the firm (in years) from the first trading day in CRSP to the date of the PE investment event.
(6) E-index	The nearest entrenchment index of competitor firms to the announcement date of PE investments.
(7) Executive wealth sensitivity to stock prices (Delta)	The sensitivity of executives' stock and option values to changes in stock prices as described in Core and Guay (1999) at the year of PE investments.
(8) Patent citations	Cumulative number of citations received from the patents granted to firms before the PE investments.
(9) Herfindahl Index	The competitor firm's Herfindahl-Hirschman index of industry concentration.
(10) ROA	The ratio of operating income to book value of assets.
(11) K-Z financial constraint index	The Kaplan and Zingales financial constraint index. Kaplan and Zingales (1997) construct a linear combination of five financial ratios that measure a firm's level of financial constraint. In this paper we follow Lamont, Polk, and Saa-Requejo (2001) and construct the K-Z index as: $-1.002 * (\text{cash flow} / \text{lagged net capital}) + 0.283 * (\text{market-to-book ratio}) + 3.139 * (\text{long-term and short-term debt} / \text{total assets}) - 39.368 * (\text{dividends} / \text{lagged net capital}) - 1.315 * (\text{slack} / \text{lagged net capital})$. Higher levels of the KZ index indicate a higher

	likelihood that a firm is financially constrained.
(12) Leverage ratio	The ratio of long-term debt to the market-adjusted value of assets (book value of debt plus market capitalization).
(13) Industry M/B ratio	The median industry market-to-book ratio in the previous year.
(14) Market cap	The firm's market capitalization.
(15) Sentiment Index	The annual investor sentiment index developed by Baker and Wurgler (2006).
(16) M&A dummy	A dummy variable equal to 1 if the PE investment event is classified as mergers and acquisitions" in Capital IQ, and zero if the events is classified as private placement.
(17) Majority Stake dummy	A dummy variable equal to 1 if the PE investors acquire majority stakes in the target firm.
(18) Public PE target dummy	A dummy variable equal to 1 if the PE target is a public firm at the announcement of PE investment.
(19) Analyst coverage	A dummy variable equal to 1 if the competitor firm has analyst coverage.
(20) % of firms with analyst coverage	The percentage of firms that have analyst coverage in a six-digit GICS industry.
(21) Cash/Assets	The ratio of cash to book value of assets.
(22) Fund size	The number of investments made by the target firm's all private equity investors in the year before the announcement.

Table II
Descriptive Statistics

In this table we report descriptive statistics for the sample of 178 PE event firms and the associated 14,288 competitor firms. Data for founding dates come from Capital IQ, the website from Jay Ritter and from Boyan Jovanovic. From these data sets we obtain firm age since founding for 63 PE investment events and 10158 competitor firms. All other variables are defined in Table I. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Private Equity Target Firms

	N	Mean	Median
Firm age since founding (Years)	178	44.54	35.00
Transaction value (\$MM)	178	3381.79	1248.14
Transaction type is M&A	178	88.76%	-
Transaction type is private placement	178	11.24%	-
Transaction is going private transaction	178	12.92%	-
Transaction is PIPE	178	7.87%	-
Percentage of majority stake transactions	178	89.33%	-
Percentage of public targets	178	35.39%	-
Specialization ratio of PE investors	178	7.34%	4.06%
PE Target's asset, if public (\$MM)	63	46179.33	1446.77
PE Target's sales, if public (\$MM)	63	1661.29	471.97
Firm age since trading, if public (Years)	63	15.94	11.00

Panel B. Industry Competitor Firms

Firm age since founding (Years)	10158	40.01	26.00
Firm age since trading (Years)	14004	15.62	11.45
Assets (\$MM)	13688	6599.87	307.10
Sales (\$MM)	13697	743.42	50.66
E-Index	4275	2.60	3.00
Executive wealth sensitivity to stock prices (Delta;\$Thousands)	3176	2792.84	563.94
Number of citations from firms' patents	12042	1423.46	0.00
Percentage of firms that have at least one citation from patents	12042	35.44%	-
Analyst coverage dummy	14288	15.89%	-
Percentage of firms that have analyst coverage in the industry	13994	11.76%	10.91%
Cash/Asset	13509	14.68%	6.04%
Herfindahl Index	13821	0.08	0.06

Table III
Abnormal Returns of the Industry Competitors for All PE Investments on Announcement Dates, Completion Dates and Withdrawal Dates

In this table we report the CAR of industry competitor firms around the announcement, completion dates, and withdrawal dates of PE investments. Panel A reports the CAR of industry competitor firms around the completion dates of 13,087 PE investments from 1980 to 2008. Panel B reports the CAR of industry competitor firms around the withdrawal dates of 212 PE investments from 1980 to 2008. Panel C reports the CAR of industry competitor firms around the announcement dates of 13,299 (later completed and withdrawn) PE investments from 1980 to 2008. Abnormal returns are computed as the difference between the actual stock price return and the expected market model return over each indicated window. The market model is estimated using 255 days of daily returns ending 100 days prior to the IPO event. We report both the Patell *Z*-statistic and the corresponding *p*-value.

Days	Panel A. Completed PE investments			Panel B. Withdrawn PE investments			Panel C. Completed+Withdrawn PE investments on announcement dates		
	N=13,087			N=212			N=13,299		
	Mean CAR	Patell <i>Z</i>	<i>P</i> -value	Mean CAR	Patell <i>Z</i>	<i>P</i> -value	Mean CAR	Patell <i>Z</i>	<i>P</i> -value
(-5,1)	-0.28%	-10.57	<0.001	0.21%	1.65	0.099	-0.21%	-8.27	<0.001
(-5,5)	-0.47%	-14.44	<0.001	0.24%	1.80	0.072	-0.37%	-11.17	<0.001
(-5,7)	-0.60%	-16.40	<0.001	0.36%	2.26	0.024	-0.60%	-13.23	<0.001
(-5,10)	-0.82%	-19.56	<0.001	0.37%	2.17	0.030	-0.72%	-17.84	<0.001
(-5,15)	-1.13%	-23.76	<0.001	0.25%	1.78	0.075	-0.98%	-21.41	<0.001
(-5,20)	-1.40%	-26.34	<0.001	0.09%	1.32	0.187	-1.40%	-24.08	<0.001

Table IV
Univariate Statistics

In this table we report univariate statistics for several performance measures (in median) for 14,288 industry competitor firms on Compustat before and after 178 PE transactions selected using the rolling-window selection mechanism. *Sales growth* is the annual percentage change of sales in 2009 dollars. *Asset growth* is the annual percentage change of assets in 2009 dollars. *Capex growth* is the annual percentage change of capital expenditure in 2009 dollars. *Operating income growth* is the annual percentage change of operating income in 2009 dollars. *R&D growth* is the annual percentage change of R&D expenditure in 2009 dollars. All other variables are defined in Table I. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Period	ROA	Asset growth	Sales growth	Capex growth	Operating income growth	R&D growth	M/B ratio	K-Z	Leverage ratio
8 Qtrs before PE	2.46%	1.40%	2.32%	38.22%	3.78%	3.44%	1.83	0.37	7.43%
8 Qtrs after PE	2.26%	0.99%	2.10%	38.42%	3.47%	2.64%	1.69	0.44	8.43%
Wilcoxon test significance	***	***	***		*	***	***	**	***

Table V
The Effect of PE Investments on Industry Competitor Firms

In this table we report estimates from a panel regression of industry competitor firms' annual stock returns, annual abnormal returns, market-to-book ratio, sales growth, growth in operating income, growth in capital expenditure, and growth in R&D expenditure on a PE transaction indicator and control variables from 1975 to 2008. $\text{Log}(1+\text{Ret})$ is the log of (1+the annual raw stock returns). $\text{Log}(1+\text{Alpha})$ is the log of (1+annual abnormal returns). When calculating the annual abnormal returns, we use the Fama-French three-factor model as the benchmark. $\text{Log}(M/B)$ is the log of annual market-to-book ratio. *Sales growth* is the difference between current log sales and log sales in the previous year. *Capital expenditure growth* is the difference between the log of current-year capital expenditure and the log of capital expenditure in the previous year. *Operating income growth* is the difference between the log of current-year operating income and the log of operating income in the previous year. *PE event dummy* is an indicator variable equal to one in the PE investment event year and the three following years. All other variables are the lagged annual variables defined in Table I. Standard errors are adjusted for clustering by industry. *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	Log(1+Ret)	Log(1+Alpha)	Log(M/B)	Sales growth	Operating Income growth	Capex growth	R&D growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>PE Event Dummy</i>	-0.095*** (-4.90)	-0.032** (-2.17)	-0.023** (-2.27)	-0.016*** (-3.23)	-0.023* (-1.98)	-0.049*** (-4.81)	-0.024*** (-4.37)
<i>Lag Dependent Variable</i>	0.013 (0.99)	0.049*** (6.19)	0.761*** (43.70)	0.030 (1.40)	-0.189*** (-18.94)	-0.204*** (-23.31)	-0.053*** (-4.11)
<i>Log(Assets)</i>	0.003 (1.55)	0.013*** (5.65)	-0.012*** (-6.09)	0.005*** (3.60)	-0.001 (-0.39)	0.013*** (7.34)	0.019*** (10.99)
<i>Log(Age Since Trading)</i>	0.027*** (5.72)	0.038*** (6.08)	0.019*** (5.15)	-0.050*** (-12.41)	-0.036*** (-9.49)	-0.044*** (-8.63)	-0.048*** (-9.55)
<i>Industry M/B Ratio</i>	-0.148*** (-11.60)	-0.066*** (-4.45)	-0.072*** (-5.96)	0.058*** (8.51)	0.082*** (5.07)	0.174*** (9.99)	0.073*** (6.62)
<i>Leverage Ratio</i>	-0.016 (-0.93)	-0.095*** (-4.39)	-0.079*** (-3.24)	-0.117*** (-6.82)	-0.048* (-1.78)	-0.570*** (-15.70)	-0.316*** (-9.67)
<i>Herfindahl Index</i>	0.289* (1.97)	0.194 (1.66)	-0.092 (-1.56)	0.122* (1.96)	0.116 (1.45)	0.554*** (3.56)	0.292* (1.94)
<i>Intercept</i>	0.210*** (6.53)	-0.160*** (-4.48)	0.251*** (7.49)	0.062*** (3.08)	0.024 (0.74)	-0.217*** (-5.72)	-0.076** (-2.37)
<i>Industry Fixed Effect?</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	113639	100723	100940	112824	85028	97895	44440
<i>R²</i>	0.0304	0.0098	0.5916	0.0224	0.0395	0.0610	0.0283

Table VI
The Effects of Competitive Advantages of Private Equity Investments on Industry Competitors' CARs

In this table we report estimates from a regression of industry competitors' CAR around the announcement date of private equity investment events, controlling for Robustness standard errors. The dependent variable is cumulative abnormal returns of competitors from the 5 days before the announcement of PE investments to 10 days after the announcement date. All other variables are defined in Table I. *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	CAR (-5, 10)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>PE Specialization</i>	-0.0549** (-10.79)					-0.1034*** (-9.25)	-0.1086*** (-9.10)	-0.1176*** (-8.92)
<i>E-Index</i>		-0.0023** (-1.98)				-0.0029** (-1.99)	-0.0033** (-2.09)	-0.0032** (-2.02)
<i>Log(Delta)</i>			0.0037*** (3.10)			0.0030* (1.89)	0.0031* (1.83)	0.0030* (1.79)
<i>Log(Patent Citations)</i>				0.0023*** (5.07)			0.0011 (1.45)	0.0008 (1.16)
<i>COGS/Sales</i>					-0.0001*** (-5.29)			-0.0285* (-1.81)
<i>Log(Age Since Trading)</i>	0.0038** (2.24)	0.0063*** (2.88)	0.0033 (1.29)	0.0035* (1.93)	0.0049*** (2.94)	0.0036 (1.22)	0.0020 (0.62)	0.0031 (0.90)
<i>Sentiment Index</i>	-0.0024 (-0.85)	-0.0074** (-2.18)	-0.0066* (-1.77)	0.0001 (0.04)	0.0006 (0.21)	-0.0120*** (-2.82)	-0.0130*** (-3.01)	-0.0118*** (-2.69)
<i>M/B Ratio</i>	-0.0000 (-0.94)	-0.0000*** (-9.38)	-0.0000*** (-8.58)	-0.0000 (-0.98)	-0.0000 (-1.08)	-0.0000*** (-8.25)	-0.0000*** (-8.05)	0.0000 (0.72)
<i>HH</i>	0.0795*** (4.18)	0.0331 (1.57)	0.1008*** (3.38)	0.0633*** (3.39)	0.0763*** (4.23)	0.0446 (1.36)	0.0326 (0.90)	0.0377 (1.04)
<i>M&A Dummy</i>	-0.0072 (-0.26)	-0.0466 (-0.65)	-0.0204 (-0.43)	-0.0077 (-0.27)	-0.0134 (-0.48)	-0.0485 (-0.67)	-0.0494 (-0.68)	-0.0540 (-0.73)
<i>Majority Stake Dummy</i>	0.0335 (1.18)	0.0669 (0.93)	0.0341 (0.71)	0.0320 (1.10)	0.0376 (1.34)	0.0667 (0.92)	0.0642 (0.87)	0.0693 (0.93)
<i>Public PE Target Dummy</i>	-0.0022 (-0.71)	-0.0055 (-1.34)	-0.0079* (-1.85)	-0.0006 (-0.20)	-0.0017 (-0.54)	-0.0052 (-1.06)	-0.0044 (-0.87)	-0.0047 (-0.93)
<i>Log(Market Cap)</i>	-0.0119*** (-8.74)	-0.0081*** (-3.53)	-0.0102*** (-3.58)	-0.0113*** (-8.20)	-0.0092*** (-7.22)	-0.0154*** (-4.40)	-0.0174*** (-4.45)	-0.0192*** (-4.67)
<i>Leverage Ratio</i>	-0.0011 (-0.11)	0.0542*** (3.60)	0.0447*** (2.87)	0.0095 (0.92)	0.0096 (0.96)	0.0419** (2.35)	0.0439** (2.29)	0.0467** (2.42)
<i>Log(Assets)</i>	0.0083*** (6.71)	0.0031 (1.54)	0.0027 (1.26)	0.0068*** (5.45)	0.0052*** (4.46)	0.0076*** (2.87)	0.0092*** (3.07)	0.0106*** (3.40)
<i>Intercept</i>	0.0570*** (4.66)	0.0452** (2.06)	0.0353 (1.42)	0.0496*** (4.05)	0.0348*** (3.05)	0.1018*** (3.37)	0.1234*** (3.64)	0.1536*** (3.92)
<i>N</i>	10970	3637	2892	10791	11200	2233	2051	2023
<i>R²</i>	0.0211	0.0306	0.0293	0.0163	0.0148	0.0627	0.0659	0.0707

Table VII
The Effects of Competitive Advantages of Private Equity Investments on the Change of Industry Competitors' Firm Value

In this table we report estimates from a regression of the change in industry competitors' value before and after the announcement date of private equity investment events, controlling for robustness standard errors. The dependent variable is the difference between the log of mean M/B ratio in the eight quarters after and the eight quarters before the PE investment event. All other variables are defined in Table I. *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	Δ M/B ratio							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>PE Specialization</i>	-0.2678*** (-21.02)					-0.2382*** (-9.98)	-0.2502*** (-9.92)	-0.2738*** (-9.84)
<i>E-Index</i>		-0.0084** (-2.18)				-0.0152*** (-3.16)	-0.0179*** (-3.51)	-0.0166*** (-3.27)
<i>Log(Delta)</i>			0.0173*** (4.91)			0.0209*** (4.39)	0.0221*** (4.49)	0.0207*** (4.26)
<i>Log(Patent Citations)</i>				0.0084*** (6.07)			0.0083*** (3.75)	0.0069*** (3.11)
<i>COGS/Sales</i>					0.0001 (0.52)			-0.0882** (-2.37)
<i>Log(Age Since Trading)</i>	0.0231*** (4.66)	0.0292*** (4.19)	0.0205** (2.47)	0.0244*** (4.79)	0.0313*** (6.51)	0.0155* (1.73)	0.0060 (0.61)	0.0129 (1.30)
<i>Sentiment Index</i>	-0.0611*** (-8.23)	-0.0730*** (-6.39)	-0.0928*** (-7.15)	-0.0525*** (-7.19)	-0.0509*** (-6.95)	-0.1203*** (-8.72)	-0.1248*** (-9.02)	-0.1240*** (-8.99)
<i>M/B Ratio</i>	-0.0002* (-1.68)	-0.0006*** (-4.50)	-0.0072** (-2.58)	-0.0002* (-1.75)	-0.0002* (-1.81)	-0.0056*** (-3.74)	-0.0055*** (-3.95)	-0.0055*** (-3.76)
<i>HH</i>	0.1172* (1.89)	0.0439 (0.58)	0.2668*** (2.75)	0.0755 (1.39)	0.1346** (2.52)	0.2510** (2.35)	0.1555 (1.35)	0.1518 (1.34)
<i>M&A Dummy</i>	0.1499** (1.97)	-0.0663 (-0.62)	0.1516 (1.51)	0.1571** (2.11)	0.1318 (1.64)	-0.0599 (-0.56)	-0.0494 (-0.44)	-0.0635 (-0.57)
<i>Majority Stake Dummy</i>	-0.0574 (-0.75)	0.1853* (1.71)	-0.0652 (-0.64)	-0.0723 (-0.96)	-0.0446 (-0.55)	0.1638 (1.51)	0.1523 (1.34)	0.1699 (1.50)
<i>Public PE Target Dummy</i>	0.0003 (0.03)	0.0075 (0.62)	0.0231* (1.75)	0.0055 (0.67)	0.0114 (1.39)	0.0257* (1.76)	0.0155 (1.05)	0.0156 (1.07)
<i>Log(Market Cap)</i>	-0.0832*** (-20.51)	-0.0701*** (-10.65)	-0.0766*** (-7.82)	-0.0746*** (-18.29)	-0.0712*** (-18.72)	-0.1019*** (-10.42)	-0.1206*** (-11.27)	-0.1240*** (-11.43)
<i>Leverage Ratio</i>	-0.1667*** (-5.47)	-0.0238 (-0.50)	-0.1137** (-2.32)	-0.1095*** (-3.76)	-0.1034*** (-3.65)	-0.0678 (-1.24)	-0.0982* (-1.74)	-0.0788 (1.38)
<i>Log(Asset)</i>	0.0794*** (18.80)	0.0545*** (8.87)	0.0474*** (6.33)	0.0682*** (16.39)	0.0672*** (17.27)	0.0643*** (8.50)	0.0798*** (9.71)	0.0840*** (10.20)
<i>Intercept</i>	-0.1408*** (-6.57)	-0.0750** (-2.06)	-0.1453*** (-2.79)	-0.1672*** (-7.82)	-0.1940*** (-9.41)	-0.0777 (-1.28)	-0.0456 (-0.71)	-0.0020 (-0.03)
<i>N</i>	11046	3603	2865	10904	11085	2220	2038	2010
<i>R²</i>	0.0753	0.0936	0.1143	0.0609	0.0602	0.1627	0.1824	0.1916

Table VIII

The Effect of PE Investments on Industry Competitor Firms Controlling for Alternative Hypotheses

In this table we report estimates from a panel regression of industry competitor firms' performance on a PE transaction indicator and control variables from 1975 to 2008. The definitions of the dependent variables are reported in Table V. All other variables are the lagged annual variables defined in Table I. Standard errors are adjusted for clustering by industry. *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable:	Log(1+Ret)	Log(1+Alpha)	Log(M/B)	Sales Growth	Operating Income Growth	Capex Growth	R&D Growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>PE Event Dummy</i>	-0.100*** (-5.18)	-0.035** (-2.43)	-0.026** (-2.63)	-0.017*** (-3.50)	-0.024** (-2.15)	-0.053*** (-5.45)	-0.026*** (-4.17)
<i>Lag Dependent Variable</i>	0.012 (0.88)	0.049*** (6.18)	0.756*** (44.59)	0.029 (1.40)	-0.190*** (-19.11)	-0.207*** (-23.88)	-0.055*** (-4.26)
<i>Log(Assets)</i>	0.002 (1.13)	0.012*** (5.70)	-0.012*** (-6.03)	0.006*** (4.49)	-0.000 (-0.23)	0.017*** (8.83)	0.020*** (11.46)
<i>Log(Age Since Trading)</i>	0.026*** (5.48)	0.038*** (5.99)	0.020*** (5.77)	-0.048*** (-12.72)	-0.036*** (-9.42)	-0.036*** (-7.16)	-0.042*** (-9.05)
<i>Industry M/B Ratio</i>	-0.1542*** (-11.36)	-0.071*** (-4.62)	-0.074*** (-5.86)	0.057*** (8.56)	0.079*** (-5.07)	0.171*** (-10.03)	0.072*** (-6.75)
<i>Leverage Ratio</i>	-0.046** (-2.52)	-0.105*** (-4.93)	-0.061** (-2.43)	-0.078*** (-4.93)	-0.043* (-1.78)	-0.446*** (-12.03)	-0.247*** (-8.04)
<i>Herfindahl Index</i>	0.235* (1.67)	0.166 (1.39)	-0.119* (-1.75)	0.130* (1.97)	0.107 (1.34)	0.592*** (3.50)	0.338** (2.08)
<i>Analyst Coverage</i>	0.009 (1.59)	0.016** (2.53)	0.014*** (3.57)	0.004 (1.24)	0.001 (0.14)	-0.009 (-1.38)	0.003 (0.05)
<i>% of Firms with Analyst Coverage</i>	-0.679*** (-2.74)	-0.407** (-2.51)	-0.601*** (-4.34)	-0.135 (-1.64)	-0.197 (-1.13)	-0.345 (-1.65)	-0.064 (-0.42)
<i>Cash/Assets</i>	-0.068*** (-3.12)	-0.017 (-0.51)	0.090*** (5.90)	0.130*** (7.94)	0.029 (1.27)	0.396*** (9.48)	0.153*** (8.81)
<i>Intercept</i>	0.330*** (7.28)	-0.095** (-2.37)	0.311*** (6.75)	0.044** (2.20)	0.046 (1.30)	-0.290*** (-6.92)	-0.132*** (-3.36)
<i>Industry Fixed Effect?</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	113615	100707	100929	112805	85013	97883	44438
<i>R²</i>	0.0278	0.0124	0.6372	0.0247	0.0405	0.0441	0.0291

Table IX
The Effects of Competitive Advantages of Private Equity Investments on Industry Competitors' CARs: Alternative Hypotheses

In this table we report estimates from a regression of industry competitors' CAR around the announcement date of private equity investment events, controlling for alternative hypotheses. The dependent variable is cumulative abnormal returns of competitors from the 5 days before the announcement of PE investments to 10 days after the announcement date. All other variables are defined in Table I. *t*-statistics (controlling for robustness standard errors) are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent Variable	CAR (-5, 10)				
	(1)	(2)	(3)	(4)	(5)
<i>Analyst Coverage</i>	-0.001 (-0.26)				-0.000 (-0.08)
<i>% of Firms with Analyst Coverage</i>		-0.044 (-0.99)			-0.057 (-1.24)
<i>Cash/Assets</i>			-0.001 (-0.03)		0.000 (0.01)
<i>Fund Size</i>				-0.000 (-1.12)	-0.000 (-1.34)
<i>PE Specialization</i>	-0.118*** (-8.95)	-0.120*** (-8.95)	-0.118*** (-8.89)	-0.120*** (-8.87)	-0.124*** (-8.89)
<i>E-Index</i>	-0.003** (-2.02)	-0.003** (-2.01)	-0.003** (-2.04)	-0.003* (-1.93)	-0.003* (-1.92)
<i>Log(Delta)</i>	0.003* (1.79)	0.003* (1.80)	0.003* (1.80)	0.003* (1.84)	0.003* (1.88)
<i>Log(Patent Citations)</i>	0.001 (1.16)	0.001 (1.19)	0.001 (1.17)	0.001 (1.18)	0.001 (1.21)
<i>COGS/Sales</i>	-0.029* (-1.81)	-0.028* (-1.80)	-0.029* (-1.75)	-0.029* (-1.83)	-0.029* (-1.77)
<i>Log(Age Since Trading)</i>	0.003 (0.89)	0.003 (0.90)	0.003 (0.88)	0.003 (0.88)	0.003 (0.85)
<i>Sentiment Index</i>	-0.012*** (-2.69)	-0.012*** (-2.68)	-0.012*** (-2.71)	-0.013*** (-2.81)	-0.013*** (-2.84)
<i>M/B Ratio</i>	0.000 (0.74)	0.000 (0.71)	0.000 (0.70)	0.000 (0.76)	0.000 (0.73)
<i>HH</i>	0.038 (1.04)	0.034 (0.94)	0.039 (1.06)	0.035 (0.95)	0.030 (0.81)
<i>M&A Dummy</i>	-0.054 (-0.74)	-0.059 (-0.80)	-0.054 (-0.73)	-0.053 (-0.72)	-0.060 (-0.81)
<i>Majority Stake Dummy</i>	0.070 (0.94)	0.075 (1.01)	0.069 (0.93)	0.068 (0.91)	0.075 (1.01)
<i>Public PE Target Dummy</i>	-0.005 (-0.93)	-0.004 (-0.88)	-0.005 (-0.90)	-0.006 (-1.07)	-0.005 (-1.01)
<i>Log(Market Cap)</i>	-0.019*** (-4.66)	-0.019*** (-4.69)	-0.019*** (-4.71)	-0.019*** (-4.57)	-0.019*** (-4.60)
<i>Leverage Ratio</i>	0.047** (2.42)	0.044** (2.28)	0.046** (2.23)	0.048** (2.47)	0.044** (2.12)
<i>Log(Assets)</i>	0.011*** (3.37)	0.011*** (3.39)	0.011*** (3.44)	0.010*** (3.24)	0.010*** (3.24)
<i>Intercept</i>	0.154*** (3.92)	0.160*** (4.01)	0.156*** (3.84)	0.152*** (3.89)	0.162*** (3.94)
<i>N</i>	2023	2023	2019	2023	2019
<i>R²</i>	0.0707	0.0711	0.0709	0.0712	0.0720