

Competitive Effects of Private Equity Investments

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FEBRUARY 2010

ABSTRACT

We analyze companies that compete with companies that receive private equity investments. We show that competitors experience a decrease in their stock prices and their operating performance around private equity (PE) investments in their industry. Furthermore, we show that the withdrawal of a previously announced PE investment leads to the exact opposite outcome: Competitors' stock prices increase in this case. We hypothesize that firms without private equity investments experience a relative decrease in performance, and we identify the underlying sources for the decrease in competitiveness by analyzing the cross-sectional differences in competitors' performance. We find that the level of specialization, corporate governance, technological innovation, managerial incentives, and efficiency are all related to performance differences among competitors at the time of the PE investment. Taken together, our findings support the hypothesis that performance differences are driven, at least in part, by the advantages by PE investors.

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I. Introduction

Private equity (PE) investments have increased enormously over the past decades. While total transaction volume amounted to \$192 billion in 2000, it increased to more than \$686 billion in 2007.² Furthermore, researchers have recognized the importance of the transactions; a growing academic literature has shed light on the performance of companies that are acquired by PE firms. Jensen (1989) is among the first to point out the benefits of private equity investors on LBOs. Similarly, Kaplan (1989) finds improved operating and cash flow margins and substantial increases in value for management buyout (MBOs) firms. More recently, Guo, Hotchkiss and Song (2009) find that PE-backed companies show significant increases in stock performance and slightly better performance in operating performance after the buyout.

While the evidence on the reaction of the target companies points to a positive effect of a PE investment, it is far less clear what drives the positive effect. We analyze this question by considering the reaction of companies that compete with those companies that receive an investment from a PE firm. If PE investments make target companies more competitive, then we should expect a negative reaction in the stock prices and the operating performance of their competitors around the PE investment. Moreover, we should expect competitors to fare even less well if their characteristics make them particularly vulnerable to competitive effects driven by PE investments.

Thus, this paper has two goals. The first goal is to analyze whether the market views PE investments as positive news by analyzing their competitors' stock price reactions. If PE firms help their

² The information of aggregate transaction volume comes from the reports by Price Waterhouse Coopers (2005) and by IFSL Research (2008; 2009).

target companies compete more successfully against other companies in their industry, then we should expect other companies to fare less well after the PE investment. The empirical evidence in this paper suggests that this is indeed the case. Competitors see a decrease in their stock prices around PE investments in their industry. Moreover, they also experience a decrease in their operating performance around these investments. We provide further evidence of the fact that the stock price reactions indeed capture the improvement in competitiveness for the target company by showing that the withdrawal of a previously announced PE investment leads to the exact opposite outcome: Competitors' stock prices *increase* in this case.

The second goal is to shed light on the underlying sources for the increase in competitiveness by analyzing the cross-sectional differences in competitors' performance. From the existing literature, we identify five possible determinants of the competitive advantage of companies that are backed by PE firms, and we analyze these determinants in our empirical tests. In what follows, we will briefly describe each source in turn.

First, for venture capital firms, Gompers et al. (2009) find that the level of specialization has positive effects on investee firms. Furthermore, for PE firms, Stromberg (2008) finds that 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. We thus use a specialization measure to test whether a higher degree of specialization leads to more negative consequences for competitors.

Second, Acharya, Hahn and Kehoe (2008) find that PE investments with higher alpha and higher margin growth are associated with greater intensity of engagement of private equity houses during the early phase of the deal. Furthermore, Kaplan and Stromberg (2008) stress a similar point in their overview paper. We thus test whether the change in corporate governance in PE-backed companies contributes to the cross sectional reaction of competitors.

Third, we analyze the importance of technological innovations. This analysis is motivated by the findings in Lerner, Sorensen, and Stromberg (2009), which shows that patents granted to companies that are involved in PE investments are cited more often after these investments.

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. Similarly, Bloom, Sadun and Van Reenen (2009) survey 4,000 medium-sized firms across Asia, Europe, and the U.S. and find PE-backed companies are better managed than other types of companies.

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

The results in the empirical analyses are consistent with all of these determinants. In particular, we find that competitors fare better when the PE investor in the target company has less industry specialization and thus expertise, if the competitors have a better system of corporate governance, more technological innovations, more aligned managerial incentives, and if they are more cost-efficient. These results hold even after taking into account control variables that capture a variety of company, market, and industry characteristics. In other words, the performance differences among competitors at the time of the PE investment are closely linked to those reasons that are associated with PE target firms' performance, giving support to the hypothesis that performance differences are driven, at least in part, by the advantages given to target firms by PE investors.

The rest of the paper is organized as follows. In the next section, we develop the hypotheses for the empirical analyses. Section III describes the data and methodology. Section IV provides the empirical results; Section V concludes.

II. Hypotheses Development

We analyze in this paper whether a PE investment in a target company has an impact on the performance of competing companies in the same industry. The performance of these competitors can be measured in different ways, and we develop in this section several hypotheses that form the basis for the empirical analyses in this paper.

Our first set of hypotheses relates to how the stock prices of competing companies react to a PE investment their industry. While a PE investment is often announced some time before the actual completion of the investment, there is substantial uncertainty at that point about whether the investment will in fact be completed. The announcement and its subsequent completion or withdrawal is thus expected to have an impact on competitors' stock returns:

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

This main hypothesis is tested in three different ways. First, as the PE investment is expected to allow the target firm to compete more successfully against its competitors, the successful completion of a PE investment should have a negative impact on competitors' stock prices:

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

However, if it is bad news for rival firms to face a completed PE investment in their industry, it should be good news for them if an expected and announced PE investment does not succeed:

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

The next hypothesis relates to the initial announcement of a PE investment. This is the earliest point of time at which information on a PE investment is released and thus the first event that can be used for an event study analysis. This analysis can thus be conducted for both PE investments that will eventually succeed and PE investments that will eventually be withdrawn. The announcement should thus have a similar effect as the completion of a PE investment, as it increases the likelihood that a PE target will eventually compete successfully against its competitors:

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

Related to the first set of hypotheses, a PE investment in a target is also expected to have a negative impact on the operating performance of the target's competitors.

HYPOTHESIS 2 (Operating Performance before and after PE Investments): *The operating performance of companies will deteriorate after a PE investment in a target that is a competitor to these companies.*

Hypotheses 1 and 2 focus on the price reaction of companies and the development of their operating performance following a PE investment in their industries. The next set of hypotheses turns to differences in the magnitude of those reactions across firms. Based on the discussion above on the

existing literature, we expect a number of factors to have an impact on the cross-sectional variation in the performance of competitors:

HYPOTHESIS 3 (Cross Sectional Differences among Competitors): *Competitors are affected to a different extent by PE investments in their industry dependent on the characteristics of the PE investor as well as their own characteristics.*

HYPOTHESIS 3a (PE Investor Specialization): *Rivals perform worse if target firms are backed by more specialized PE investors.*

HYPOTHESIS 3b (Corporate Governance): *Better governed rivals perform better after PE events.*

HYPOTHESIS 3c (Managerial Incentives): *Rivals with better managerial incentives perform better after PE events.*

HYPOTHESIS 3d (Technological Innovation): *More innovative rivals perform better after PE events.*

HYPOTHESIS 3e (Operating Efficiency): *Less cost-efficient rivals perform worse after PE events.*

III. Data and Methodology

The data on private equity (PE) transactions come from the Capital IQ Database. The Capital IQ database provides two main advantages for the purpose of this study. First, Capital IQ provides a comprehensive coverage of PE investments, especially after 1999.³ Second, Capital IQ uses the Global

³ See Stromberg (2008) and Lerner, Stromberg and Sorensen (2009) for further descriptions on the Capital IQ database.

Industry Classification Standard (GICS). According to Bhojraj, Lee and Oler (2003), GICS is a better industry classification than SIC and NAICS in explaining key financial ratios and thus suites well for the study of the effect of private equity investments on industry competitors.

In this paper, we investigate how PE investments affect industry competitors by conducting (1) short-term analyses of the industry competitors' stock price reactions around the announcement, completion and withdrawal of PE investments, and (2) long-term analyses of industry competitors' performance in the three years after the PE investments. In what follows, we describe the selection of the private equity investments sample used in the short-term and long-term analyses. Finally we describe the selection of industry competitors of PE investments.

A. The Sample of PE Investments for the 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 that (1) the buyers of the M&A transactions are categorized as “private equity investors”, (2) the value of the transaction must be greater than 10 million dollars, and (3) the transactions are in the United States and in Canada and are announced between 1980 and 2008. These selection criteria result in a sample of 13,468 completed and 212 withdrawn PE investments in 64 six-digit GICS industries.⁴ Among the sample of 13,468 PE investments, 13,087 PE investments have CRSP daily stock return data. Thus, in the empirical results section, we analyze industry competitors' short-term price reactions for 13,087 completed and 212 withdrawn PE investments.

B. The Sample of PE Investments for the Long-term Analyses

⁴ Bhojraj, Lee and Oler (2003) also identify industries based on the six-digit GICS codes.

In the sample of private equity investments used in the short-term analyses, it is often the case that PE investments are not isolated in time, i.e., more than one investment occurs in an industry in a given year. This creates an issue when we study the long-term effects of private equity investments on their publicly traded competitors: The results could be potentially contaminated by the impact of other private equity investments in the same industry around the same time. As an illustration, assume we choose a relatively small PE investment as an event. If a larger PE investment occurs during our measurement period, the effect of our chosen event on industry competitors would be contaminated by the effect of the larger PE investment. Thus, it is important to identify private equity investments with the lowest potential of other private equity investments contaminating the results. We therefore follow the rolling-window selection method proposed by Hsu, Reed, and Rocholl (2009) and select the PE investment events by identifying those PE investments that are not preceded or followed by a larger PE investment in the same industry in the surrounding six years. We use transaction value as the measure of size in order to minimize cross-PE-investment contamination of the results. Following our selection criterion, we obtain 178 PE investment events.

The advantages of the rolling window selection include the maximum use of data so we can utilize all PE investments that have a minimally contaminated measurement period, and reducing the bias that arises from the selection of PE investments based on arbitrarily defined periods of time. As Figure 2 shows, the PE investments events chosen using this method spread relatively evenly across the sample years, and there are at most 24 PE investments events in any given sample year.

C. Sample of Industry Competitors and Other Data

Finally, we identify existing firms in the same six-digit GICS industry as the PE investment events, and we define them as competitors. We further restrict competitor firms in our sample to those

that were publicly listed at least three years before the PE investment event year so that we can clearly observe the difference in performance before and after the PE investment event.

Moreover, we obtain accounting information on both PE investments and industry competitors from Compustat. We further obtain competitors' entrenchment index from Lucian Bebchuk's website.⁵ To calculate competitors' executive wealth sensitivity 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 describes the definition of the variables used in this paper.

In Table II, we report descriptive statistics of both the 178 PE investments and their 14,288 competitors. Panel A shows that the mean transaction value of PE investments amounts to 3.38 billion dollars, reflecting the sample selection criterion that focuses on PE investments that are large relative to other industry PE investments. A further look at the type of the PE investments suggests that 88.76% and thus the vast majority of the PE investments are mergers and acquisitions, while the remaining 11.24% of the PE investments are private placements. In addition, only 63 of the 178 PE targets (35.39%) are public at the time of the PE investment. Among the 63 public PE targets, 23 (12.92%) are going private transactions and 14 (7.87%) are private investments in public equity (PIPE). Finally, in Panel A we also report the statistics on the industry specialization and thus experience of the PE investors of these targets. The average number of PE investors' total prior investments is 116.16, among which 5.4 investments are in the same industry as the target firm. The average specialization ratio of PE investors, which is the ratio of PE investors' prior industry investments divided by total prior investments, amounts to 7.34%.

Panel B (Table II) reports the descriptive statistics of 14,288 industry competitor firms. The variables include firm age, firm size, and four variables that measure the cross-sectional determinants of

⁵ See <http://www.law.harvard.edu/faculty/bebchuk/data.shtml>.

the underperformance of industry competitor firms around and after the PE investments: Corporate governance, managerial incentives, technological innovation, and operating efficiency.

IV. Empirical Results

In Section II, we develop three main sets of empirical hypotheses for the impact of PE investments in targets on competitors. These hypotheses are tested in this section. We analyze the competitors' short-term price reactions to PE investments, the univariate change in their operating performance before and after PE investments, and the cross-sectional determinants of these changes.

A. Short-term Price Reaction

Hypothesis 1 states that stock prices of publicly traded firms react to PE investments in their industry. Figure 1 shows the cumulative abnormal return for industry competitors at the point of time at which a PE investment in a company in their industry occurs. The figure shows that competitors' stocks do not exhibit abnormal returns until 15 days before the announcement or completion of a PE investment, but that they become gradually more negative afterwards. The development of stock prices following the announcement or completion of PE investments exhibits a parallel trend, and their average cumulative abnormal return (CAR) amounts to about -1.5% after 20 days. In strict contrast, the stock prices for withdrawn PE investments show no particular trend until 10 days before the withdrawal, but then they become and remain positive until 20 days after the withdrawal. This figure provides first evidence that PE investments induce stock price reactions for industry competitors. We test the first set of hypotheses more formally by analyzing the CARs for the different events and event windows.

A.1 Returns around Completed PE Investments

We first test Hypothesis 1a more formally and analyze the market-adjusted stock returns of competitors around the completion of 13,087 PE investments in the time period between 1980 and 2008. Panel A of Table III shows the average stock market returns for different event windows, which start five days before the completion date and last up to 20 days after the completion date. As the returns for companies in a given industry might be correlated around a PE investment in their industry, we form portfolios of these companies for each of the given PE investments, calculate a portfolio return for each PE investment, and then average these portfolio returns across the PE investments. The results suggest that the returns for competitors start decreasing right around the completion of PE investments in their industry. The CAR for the shortest window between five days before and one day after the event amounts to -0.28% and is statistically significant at the 1% level. The same holds for each of the observed event windows; the CAR for the competitors stays negative and statistically significant at the 1% level for each event window. The CAR decreases monotonically for the longer event windows and reaches a minimum of -1.40% for the window between five days before and 20 days after the event. These results provide evidence in support of Hypothesis 1a and suggest that competitors experience a decrease in their stock price at and around the completion of PE investments in their industry. The applied portfolio approach diminishes the effect of a specific PE investment and thus speaks to the generality of the observed result.

A.2. Returns around Withdrawn PE Investments

Hypothesis 1b states that the withdrawal of an initially announced PE investment is expected to generate positive stock returns for industry competitors and thus the exact opposite outcome from the results obtained for the completed PE investments. We identify a total number of 212 withdrawn PE investments and use the same methodology as before 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, and the returns are statistically significant at least at the 10% level for each of them except for the longest one. Withdrawal stock returns thus show a pattern exactly 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 and thus the earliest point of time at which the public learns about it. The announcement of a PE investment can subsequently lead to the two outcomes described and analyzed before: its completion or its withdrawal. The announcement of a PE investment is thus expected to have a similar impact as its completion since it significantly increases the likelihood that companies in a given industry have to face the competition of a company that is backed by a PE investor. We test this hypothesis in the same way as before and analyze the returns for competitors around the announcement of a PE investment in their industry. The results, which are presented in Panel C of Table III, provide empirical evidence that is consistent with Hypothesis 1c. The event returns for competitors are negative and statistically significant at the 1% level for each of the observed event windows. They amount to -0.21% for the shortest event window between five days before and one day after the PE investment and to -1.40% for the longest event window between five days before and 20 days after the event window. Taken together, the results in this subsection provide evidence that the returns of competitors around the announcement day of a PE investment are negative.⁶

⁶ In an unreported test, we analyze the industry competitors' CAR around the announcement and completion dates of 178 PE investment events using the 6-year rolling-window selection mechanism. We still find that industry competitors experience negative and significant stock returns around these event dates.

In summary, the results for the short-term results are consistent with Hypothesis 1 and suggest that 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' operating performance.

B. Operating Performance before and after PE Investments

The previous evidence suggests that the market perceives a PE investment in a company as bad news for its competitors that induce their stock prices to decrease. Hypothesis 2 states that we should expect a similar decrease in the operating performance of these competitors. We analyze the development of the operating performance of competitors by following key performance variable eight quarters before and eight quarters after the PE investment. The results are presented in Table IV and suggest that competitors indeed experience a decrease in operating performance. The results suggest that key ratios such as the return on assets (ROA), asset growth, sales growth, operating income growth, R&D growth, market-to-book ratio (M/B ratio), Kaplan and Zingales financial constraint index (K-Z), and leverage ratio exhibit a negative trend after the PE investment in their industry. For example, ROA decreases from 2.46% before the PE investment to 2.26% afterwards, and asset growth decreases from 1.40% to 0.99%. Likewise, the market-to-book ratio decreases from 1.83 to 1.69. These results suggest that the financial flexibility of the competitors decreases. In sum, these results provide evidence for Hypothesis 2 and suggest that competitors are indeed negatively affected also in their operating performance after a PE investment in their industry.

C. Multivariate Results

The univariate results so far suggest that PE investments affect the performance of industry competitors, but one might question whether there are other factors that explain the results. In what follows, we look at performance through time to determine whether performance declines are

significantly affected by PE investments even after controlling for a number of factors that are known to predict performance. Our approach is to model performance as a function of firm size, firm age, industry valuation, and past performance. In other words, we would like to test Hypothesis 2 by measuring abnormal performance by controlling for a number of factors that are known to predict 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 the panel regression, we use the following seven measures for industry competitors' performance in each year t for every firm i ($Performance_{i,t}$): (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 expenditure growth and (7) R&D growth. The indicator variable $PE_{i,t}$ is equal to one if year t is within a three year period starting with a large PE investment in firm i 's industry and zero otherwise. The sample comprises as many years as possible for each firm; thus, we 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 fixed effects; there is a separate constant term for each industry.

In Table V, Model 4, we see that sales growth is affected significantly by age, size, and the market to book ratio. For example, older firms perform worse than younger firms, as indicated by the negative coefficient for the age variable. These relationships hold throughout the sample, but there is still a statistically significant decline in sales growth in PE investment years. In other words, competitors face a 1.6% decline in sales growth in the years in which a large PE investment occurs in the same industry. Similarly, operating income growth declines by a statistically significant 2.3% in PE investment years (Model 5), and capex growth declines by a statistically significant 4.9% in PE

investment years (Model 6). Overall, measures of performance based on firm profitability decline in PE investment years after age, size, and industry valuation are controlled for.

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 affect performance every year. In this section, we investigate whether declines in performance in PE investment years are related to specific competitive advantages of 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: specialization, corporate governance, managerial incentives, technological innovation and operating efficiency. Specifically, we run the following cross sectional regression:

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

In our first specification, we measure performance as the cumulative abnormal stock returns of competitors from 5 days before the announcement of PE investments to 10 days after the announcement date of PE investment event e in competitor i 's industry. We test our five main 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 previous approach, 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 will describe each effect in detail.

D1. Specialization

One of the potential mechanisms behind poor competitor performance is the specialization of PE investors. Gompers et al. (2009) find the level of specialization of VCs has positive effects on investee firms. Similarly, Cressy, Munari, and Malipiero (2008) find that firms backed by more specialized PEs show significantly increasing operating performance. Given these findings, if PE investments are indeed helpful to target firms, then we would expect the extent of the decrease in competitors' performance to be linked to the extent of PE investor specialization.

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). We find that there is a negative and statistically significant coefficient of -0.0549 on *PE Specialization* (Table VI, Model 1), which indicates that competitors have significantly weaker performance when PE investments in their industry are announced by specialized PE firms. The fact that specialized PE investments deteriorate performance more than their less specialized counterparts is consistent with the conclusions of Gompers et al. (2009) and Cressy, Munari, and Malipiero (2008), and it serves as one of the reasons that PE target firms perform better than their competitors.

D2. Governance

To test whether corporate governance plays a role in the performance of competitors, 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)). Acharya, Hahn and Kehoe (2008) and Kaplan and Stromberg (2008) find that PE investments with higher alpha and higher margin growth are associated with greater intensity of engagement of private equity firms, contributing the more performance increases for better governed firms around the time of PE investments. The statistically

significant coefficient estimate of -0.0023 (Table VI, Model 2) indicates that competitors with better corporate governance perform better than other firms. This result is consistent with the view that, as described in Hahn and Kehoe (2008), PE investments in better governed firms are associated with greater intensity of engagement of private equity firms.

D3. Compensation

To test whether manager compensation is an important determinant of the poor performance of competitors, we measure the sensitivity of executives' stock and option values to changes in stock prices at the year of PE investment, as described in Core and Guay (1999). We have strong reason to believe that compensation may contribute to target firm out performance; Leslie and Oyer (2009) document that PE-owned firms use much stronger incentives for their top executives, and U.S. and find PE-backed firms are better managed than government, family, and privately owned firms. The statistically significant coefficient estimate of 0.0037 (Table VI, Model 3) indicates that competitors with compensation packages that are more sensitive to share prices perform better than other firms. 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. Innovation

Lerner, Sorensen, and Stromberg (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 ask whether this improvement contributes to the performance declines of competitors by measuring the cumulative number of citations received from the patents granted to firms before the PE investment event. The statistically significant coefficient estimate of 0.0023 (Table VI, Model 4) indicates that competitors with fewer patent citations have larger

performance declines around the time of the PE investment. This result is consistent with the view that PE investors improve technological innovation. Of the five hypotheses, this particular hypothesis is relatively weak when compared with the others. Specifically, the coefficient on patent citations is insignificant in (Table VI, Model 8).

D5. 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. The statistically significant coefficient estimate of -0.0001 (Table VI, Model 5) indicates that competitors with better operational efficiency perform better than other firms. Kaplan and Stromberg (2008) suggest that PE investments may contribute to increases in efficiency, and the regression results presented here are consistent with the view that relative performance decreases as with measured decreases in operational efficiency. Interestingly, this result is particularly strong in the multi-hypothesis model, (Table VI, Model 8) where the coefficient estimate is -0.0285. Table VII presents similar results for changes in market value, and the results are largely the same.

VI. Conclusion

We analyze the reaction of competitors to those companies that receive investments from PE firms. We find that competitors see a decrease in their stock prices around PE investments in their industry. Moreover, they also experience a decrease in their operating performance around these investments. We provide evidence for the hypothesis that the stock price reactions capture the improvement in competitiveness for the target company by showing that the withdrawal of a previously announced PE investment leads to the exact opposite outcome: Competitors' stock prices increase.

We analyze 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, if the competitors have a better system of corporate governance, more technological innovations, more aligned managerial incentives, and if they are more cost-efficient. In other words, the performance differences among competitors at the time of the PE investment are closely linked to the features associated with PE target firms' performance, giving support to the hypothesis that performance differences are driven, at least in part, by the advantages given to target firms by PE investors.

These results suggest that PE investments have competitive effects in their industries. The evidence we present has implications for investors, particularly in the assessment of the expected risk and return of companies in industries in which there is a high probability of new PE investments. Likewise, these companies need to understand how PE investments affect their competitive position and how they can respond to it. The paper also sheds new light on the analysis that is conducted by companies considering investments by PE firms.

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Figure 1
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.

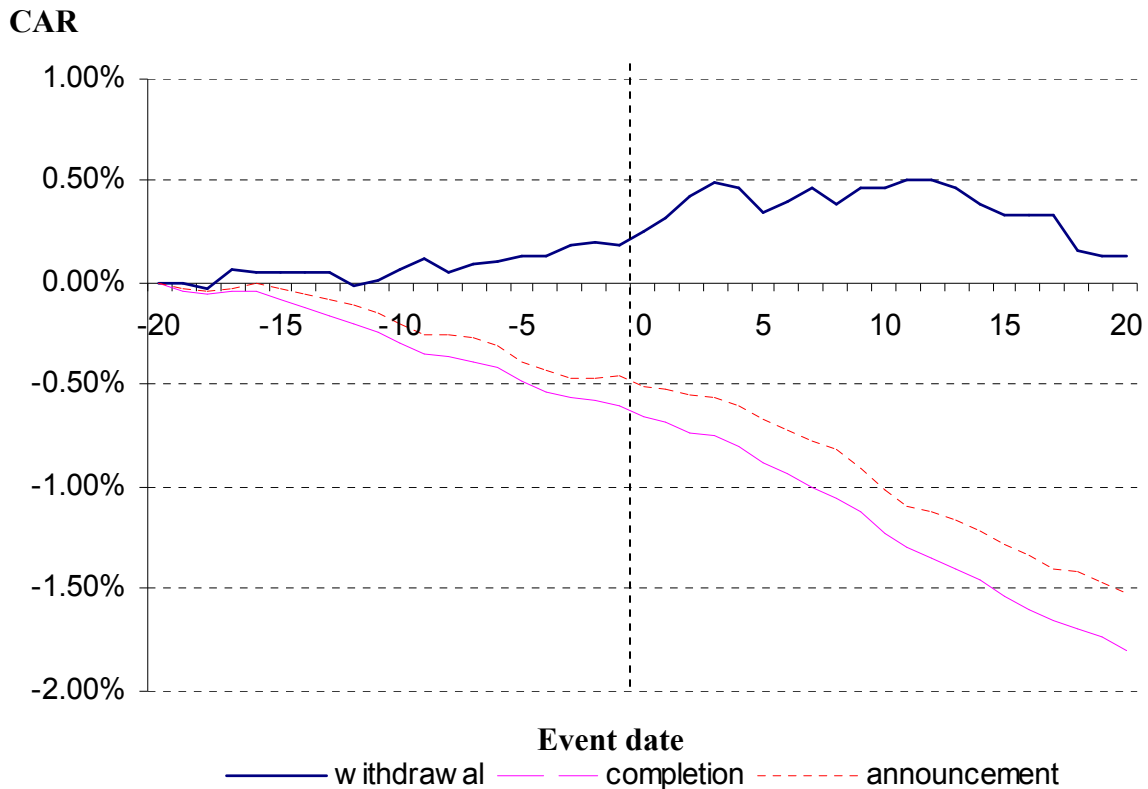


Figure 2
The Time Distribution of 178 Rolling-window Private Equity Investments

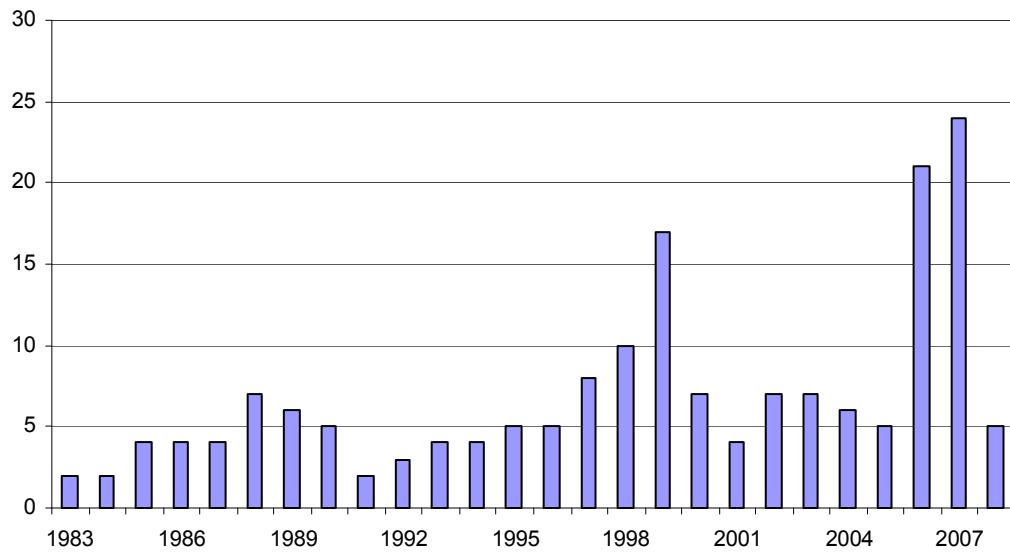


Table I
Variable Definitions

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) Number of PE investors' prior investments	The sum of total prior PE investments made by all PE investors of the target firm.
(3) Number of PE investors' prior industry investments	The sum of total prior PE investments made by all PE investors that is in the same four-digit GICS industry as the target firm.
(4) Specialization ratio of PE investors	The ratio of (3) divided by (2), as proposed by Gompers, Kovner and Lerner (2009).
(5) Asset	Book value of assets.
(6) Sales	Book value of sales.
(7) 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.
(8) E-index	The closest entrenchment index of competitor firms to the announcement date of PE investments.
(9) 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.
(10) Patent citations	Cumulative number of citations received from the patents granted to firms before the PE investments.
(11) Herfindahl Index	The competitor firm's Herfindahl-Hirschman index of industry concentration.
(12) ROA	The ratio of operating income to book value of assets.
(13) 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: $-1.002 * (\text{cash flow} / \text{lagged net capital}) + 0.283 * (\text{market-to-book ratio}) + 3.139 * (\text{long-term and short-term debt} / \text{total assets}) - 39.368 *$

	(dividends/lagged net capital) – 1.315 *(slack/lagged net capital). Higher levels of the KZ index indicate a higher likelihood that a firm is financially constrained.
(14) Leverage ratio	The ratio of long-term debt to the market- adjusted value of assets (book value of debt plus market capitalization).
(15) Industry M/B ratio	The median industry market-to-book ratio in the previous year.
(16) Market cap	The firm's market capitalization.
(17) Sentiment Index	The annual investor sentiment index developed by Baker and Wurgler (2006).
(18) 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.
(19) Majority Stake dummy	A dummy variable equal to 1 if the PE investors acquire majority stakes in the target firm.
(20) Public PE target dummy	A dummy variable equal to 1 if the PE target is a public firm at the announcement of PE investment.

Table II
Descriptive Statistics

In this table we report descriptive statistics for the sample of 178 PE investment event firms and 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%	0.00
Number of PE investors' prior investments	178	116.16	27.50
Number of PE investors' prior industry investments	178	5.40	2.00
Specialization ratio of PE investors	178	7.34%	4.06%
PE Target's asset, if public (\$MM)	63	46179.33	1446.77

Panel B. Industry Competitor Firms

	N	Mean	Median
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%	-
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 announcement dates of all 13,299 PE investments from 1980 to 2008. Panel B reports the CAR of industry competitor firms around completion dates of 13,087 PE investments from 1980 to 2008. Panel C reports the CAR of industry competitor firms around the withdrawal dates of 212 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 42 days prior to the IPO event. We report both the Patell Z-statistic and the corresponding *p*-value.

	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		
Days	Mean CAR	Patell Z	P-value	Mean CAR	Patell Z	P-value	Mean CAR	Patell Z	P-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 are reported. ***, **, 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
Panel A. Performance and financial soundness of incumbent firms									
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' 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)
PE event dummy	-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)
Lag dependent variable	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)
Log(Assets)	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)
Log(Age since trading)	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)
Industry M/B ratio	-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)
Leverage ratio	-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)
Herfindahl index	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)
Intercept	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)
Industry Fixed Effect?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	113639	100723	100940	112824	85028	97895	44440
R ²	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 before the PE investments. *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)
PE specialization	-0.0549** (-10.79)					-0.1034*** (-9.25)	-0.1086*** (-9.10)	-0.1176*** (-8.92)
E-index		-0.0023** (-1.98)				-0.0029** (-1.99)	-0.0033** (-2.09)	-0.0032** (-2.02)
Log(Delta)			0.0037*** (3.10)			0.0030* (1.89)	0.0031* (1.83)	0.0030* (1.79)
Log(Patent citations)				0.0023*** (5.07)			0.0011 (1.45)	0.0008 (1.16)
COGS/Sales					-0.0001*** (-5.29)			-0.0285* (-1.81)
Log(Age since trading)	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)
Sentiment index	-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)
M/B ratio	-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)
HH	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)
M&A dummy	-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)
Majority Stake Dummy	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)
Public PE target dummy	-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)
Log(Market cap)	-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)
Leverage ratio	-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)
Log(Assets)	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)
Intercept	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)
N	10970	3637	2892	10791	11200	2233	2051	2023
R ²	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 before the announcement of PE investments. *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)
PE specialization	-0.2678*** (-21.02)					-0.2382*** (-9.98)	-0.2502*** (-9.92)	-0.2738*** (-9.84)
E-index		-0.0084** (-2.18)				-0.0152*** (-3.16)	-0.0179*** (-3.51)	-0.0166*** (-3.27)
Log(Delta)			0.0173*** (4.91)			0.0209*** (4.39)	0.0221*** (4.49)	0.0207*** (4.26)
Log(Patent citations)				0.0084*** (6.07)			0.0083*** (3.75)	0.0069*** (3.11)
COGS/Sales					0.0001 (0.52)			-0.0882** (-2.37)
Log(Age since trading)	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)
Sentiment index	-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)
M/B ratio	-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)
HH	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)
M&A dummy	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)
Majority Stake Dummy	-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)
Public PE target dummy	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)
Log(Market cap)	-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)
Leverage ratio	-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)
Log(Asset)	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)
Intercept	-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)
N	11046	3603	2865	10904	11085	2220	2038	2010
R ²	0.0753	0.0936	0.1143	0.0609	0.0602	0.1627	0.1824	0.1916