The Post-IPO Performance of Private Equity Backed Firms During the Great Recession

Jack Trifts and Gary E Porter

Abstract

We examine the performance of PE-backed firms following their IPOs during the expansionary period of the early 2000s and their performance during the "great recession." We employ a control group using multi-digit NAICS codes, which allows us to match firms much more closely than prior studies. The results during the market expansion of the early decade parallel those of the existing literature, showing PE-backed firms perform as well or better than non-PE-backed firms. However, while those studies conclude that IPOs are generally a positive addition to the market and its investors, we show their performance is significantly worse than their non-PE-backed peers during the great recession, suggesting the success of these firms is particularly dependent on the state of the economy.

I. Introduction

Private Equity (PE) groups play a significant role in bringing firms public. In some cases, growing firms accept or even seek PE investment and management guidance as the final step in their move from privately held to public companies. In these cases, the PE groups often have extensive experience in the industry and with taking companies through the preparations for, and execution of, their initial public offering (IPO). In other cases, PE involvement occurs as part of a management buyout of an existing public company, or a division of a public company. In these cases, the resulting independent company operates a portfolio company with the PE groups guidance for a period from one to several years before reemerging as an independent entity on the public market through an IPO.

In all cases, the PE group plays a significant role in the governance of the firm before and immediately after its IPO. Almost invariably, the PE group will appoint one or more board members. It is also common for PE groups to enter consulting relationships with their portfolio companies and receive compensation for this role. It is also common for the PE backed private firm to raise significant debt, some of which may be paid to the PE groups in a special dividend. As a result, these firms may come to the public market with significant leverage.

Our study examines the post-IPO financial performance of PE-backed firms compared to similar firms without PE backing. Unlike other studies, we focus on the group of IPOs occurring in the five years leading up to the "great recession," which began in January 2.008 and ending in mid-2009. While prior studies have examined the post-IPO performance of PE backed firms, none have examined their performance in such challenging economic conditions.

Jack Trifts (jacktrifts@yahoo.com), Professor Emeritus, Bryant University and Gary E. Porter (g.porter@northeastern.edu), corresponding author, Northeastern University.

This paper is organized as follows. In the next section, we discuss the existing literature and contrast the prior authors work with ours. We next discuss our data and methodology and follow that with a discussion of our findings. We end with a summary and discussion of the implications of our work and suggestions for further research.

II. The Literature

In their seminal work, Holthausen and Larcker (1996) studied the financial performance in the four years following reverse LBOs occurring from 1976 to 1988. They found evidence that the post-IPO performance of these companies was better than that of similar firms that had not been subject to reverse IPOs. They attribute this enhanced performance to organizational incentives, namely higher degrees of managerial ownership and increased monitoring by active investors (the PE firms). While this paper is widely cited, the generality of these findings is limited by the timing of their data. While their study included IPOs from 1976 through 1988, 65 of their 90 IPOs occurred between 1983 and 1986 with only two occurring later than 1986. As a result, their effectively four-year study was focused overwhelmingly in the period from 1987 to 1990, well after the recessionary period in 1980 to 1982 and before the recession from July 1990 to March 1991. In contrast, our sample firms came to market in the period prior to the great recession and experienced a very different economic environment than most of Holthausen and Larcker's sample.

Cao and Lerner (2009) also studied the performance of reverse LBOs using a dataset of 526 transactions from 1981 to 2003. They followed the post-IPO firms for five years and found evidence that these firms performed as well or better than other IPOs during the period. While their study was more comprehensive than Holthausen and Larcker's initial work, their period of study did not include the great recession. Of the 526 transactions, only 16 were from 2003 and 25 were from 2002. The end of the five-year window of study for the 2003 observations would have included the recessionary period in 2008. The study window for IPOs occurring near the end of 2002 would have included the very beginning of the recession starting January 2008. However, observations from these two years combined represent only 7.8 percent of the total sample and would be unlikely to significantly influence the results. Interestingly, Cao and Lerner did document some decline in performance near the end of their five-year windows. Perhaps inclusion of these firms having IPOs that were affected by the recession influenced this result.

The choice of time period for studies such as this one is very important and can be reasonably expected to affect, if not drive the results. As Prassl (2015) notes in his review of two scholarly books on the topic, by Appelbaum and Batt (2014) and Gospel, Pendelton and Vitols (2013), "given the high degrees of debt, or leverage, and frequent refinancing models involved, even relatively small changes in the business environment can quickly lead to bankruptcies."

An element that is potentially very important to the outcome of the study of post-IPO performance is the selection of the control group against which to measure differences in performance. Holthausen and Larcker (1996) compare the performance of their sample of reverse LBOs to an industry group of firms sharing the same two-digit SIC (Standard Industrial Classification) code. While using a broad definition of industry such as theirs will result in a large number of comparable firms, the similarity of the sample firms to their control firms is questionable. For example, the two-digit SIC code 58 is for "Eating and Drinking Places." This category includes both the NASDAQ listed Ruth's Hospitality Group, operators of Ruth's Chris Steakhouse, and the NYSE listed McDonalds Corporation. Admittedly, both are clearly eating

and drinking establishments but by most measures are quite different companies. Furthermore, one might reasonably expect these companies to be affected quite differently by recessions and other changes in the business environment.

Cao and Lerner (2009) improve the benchmarking process by using industry portfolios of companies with similar size and book-to-market ratios. The addition of size and market-to-book comparisons is likely to improve the comparability of the benchmark firms. However, the problems with the selection of the industry persists as they use benchmark industry portfolios assembled each year by Kenneth French.[1] While this process is much more detailed, it still can result in quite different firms being used as benchmarks. For example, the authors' use of French's second-most detailed portfolio group results in the market being divided into 48 distinct industries. Extending the example used above with restaurants, presumably both McDonalds and Ruth's Chris are still considered part of the "meals" industry.

Another element of methodology that varied across existing studies is the length of the period over which the performance of the sample firms is studied. Holthausen and Larcker (1996) studied the performance of their sample over the subsequent four years. Cao and Lerner (2009) study IPO post-performance over 5 years. Levis (2011), who examined the performance of PE-backed IPOs, studied his sample's post-performance for three years. The evaluation of performance over a short window of three to five years may bias the results towards finding superior or at least non-inferior performance. This may occur because of a sort of "emergence bias."[2]

III. Data and Methodology

Using Factset, we identified 224 IPOs potentially backed by PE groups occurring between January 1, 2002 and June 30, 2007 on the NASDAQ, NYSE and NYSE MKT LLC (former AMEX). In addition, we used the dataset provided by Dalseth and Larsen (2018) in their working paper. Their dataset of US, PE-backed IPOs included 116 IPOs from 2002 through mid-2007. While there was a substantial overlap between the two sources, they were not identical. The Factset generated list included many more transactions than Dalseth and Larsen and their dataset contained some not identified by Factset. In total, there were 103 IPOs that appeared on both lists.

While these differences might initially seem worrisome, they result from two causes. First, the list provided by Dalseth and Larsen had already been culled of observations that were not PE-backed transactions. Of the 52 transactions we eliminated because we did not believe that they were actually PE backed, only six were included in Dalseth and Larsen's final sample.

Determining that a particular IPO is or is not backed by a PE group is more difficult than it might appear. PE groups typically do not publicly announce new investments, nor do many firms that receive investments. While most PE groups today maintain websites that disclose their portfolio companies, most do not show historical investments, particularly in companies in which they no longer have any stake. Further, it is common practice for PE groups to structure the investments in their portfolio so that there is no shared liability between group companies. The investment vehicles they use have different names which may or may not include the name of the

[1] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[2] As Appelbaum and Batt (2014) detail, many of the firms in which PE groups invest never make it to completed IPOs. Portfolio companies that do not perform well enough to bring to an IPO are sold to other PE groups specializing in their industry or to larger companies seeking expansion through acquisition. Also, some portfolio firms fail. As a result, the firms that successfully come to market through IPOs do not represent a cross section of PE-backed firms but rather the most successful of the group. This being so, it is reasonable to expect that these firms might be expected to perform well, at least initially.

backing PE group. Additionally, growing firms receive investment from many sources other than PE groups, including venture capital groups and individuals.

To ensure the accuracy of our sample, the security registration statement (S-1) for each IPO was retrieved from the Securities and Exchange Commission's EDGAR site. To verify the participation of a PE group, we searched the document for reference to a PE group. The participation of PE groups shows up in several ways in S-1 statements. For example, S-1 statements include brief bios of the company board of directors and these bios often reference directors with management position in PE groups. Each S-1 also includes sections on "Principal Stockholders" and "Certain Relationships and Related Party Transactions." Using these, we were able to verify PE participation for the sample firms.

In some cases, investment groups were identified without specifically identifying them as PE groups. To distinguish PE investments from other investments, we used two techniques. First, Appelbaum and Batt (2014, p. 118) provide a list of the 26 largest PE groups and many of our sample firms include investments from these firms. Second, for firms that are not listed among the largest, we researched the companies via an internet search. We include only those companies that are clearly involved in PE investment.

Our final sample includes 147 IPOs. A list of these transactions is shown in the Appendix. The accompanying table shows the distribution of IPOs by year. The data show some clustering towards the end of the sample period, probably reflecting the buoyant economy in the final years of the expansion before the financial collapse.

Table 1: Private Equity-Backed IPOs occurring on the NASDAQ, NYSE and NYSE MKT LLC	
2002	10
2003	13
2004	30
2005	45
2006	49
Total	147

We believe that one of the contributions of our study is in the improvement in the selection of the control sample. After identifying the sample of IPOs with PE backing, we built a control sample against which to compare their performance in the subsequent period. Prior studies have used two approaches, comparing the sample firms to a portfolio of all firms with the same two-digit SIC and against broad market indices. There are two potential problems with the use of two-digit SICs. First, as noted earlier, two-digit codes capture a wide range of firms and associated business models within each industry.

The second problem is less obvious but very important. We noticed a "clustering" phenomenon in our sample, where some industries have large numbers of PE-backed IPOs over a relatively short period. For example, our sample contains 17 firms in the "Business Services" industry (SIC 73), 13 firms in the "Chemicals and Allied Products" industry (SIC 28), 11 firms in the "Insurance Carriers" industry (SIC 63), and 7 firms in each of the "Communications" and "Instruments and Related Products" industries (SIC 48 and 38). As a result of this clustering within

industries, comparing the performance of a particular PE-backed IPO firm against a portfolio of all firms with the same two-digit SICs results in a control group that may contain one or more firms also backed by PE groups. This makes the study of portfolios of IPOs problematic.

To make better comparisons, we sought a matched set of control firms based on six-digit NAICS (North American Industrial Classification System) codes, eliminating any firms that were themselves backed by PE groups. From a list of all publicly traded firms with data during the test period, we selected the company with the same six-digit NAICS code and nearest in size by Market Capitalization. We then examined the company's 10-K in the year of the sample firm's IPO for evidence of PE backing, followed by an internet search for such evidence. In the final sample of 147 firms, 119 have control firms with matching six-digit NAICS codes and no evidence of PE-backing. In those cases where there was no matching six-digit code, we attempted to match using the first five digits of the NAICS code. If that did not result in a match, we continued to drop the ending digits of the sample firm's NAICS code until a match was reached. As shown in the accompanying table, we were able to find a six-digit match for 119 (81 percent) companies in the sample. In only one case did we have to rely on only the first two digits, and this pair was a suitable match.

Table 2: NAICS Distribution

Number of NAICS Code Digits Matched	Number of Sample Firms
6 of 6	119
5 of 6	4
4 of 6	10
3 of 6	13
2 of 6	1
Total	147

This study follows the sample firms from the date of their IPO to June 2010 (three years after the sample selection period) or until they are delisted, acquired, or otherwise cease to operate as the entity that emerged from the IPO. This lengthy period of study, ranging from three to over eight years, is important since it will allow the capture of events that may take substantial time to unfold but still be related to the firm's prior status as an LBO target. For example, Campbell, Hilscher and Szilagyi (2010) develop and test a model to predict financial distress. Their model shows predictive power three years in advance of what Campbell et al term a failure event, defined as a bankruptcy filing, delisting for distress-related reasons, or the receipt of a D credit rating. Since it is highly unlikely that a PE group could successfully bring a firm showing signs of financial distress to market, a study window of three or four years is likely to miss many firms that will develop financial distress but not show significant underperformance, or experience failure events, until significantly later.

To compare performance, we examined a range of financial and market-related data. The accompanying table shows the list of metrics. The post-IPO performance of the sample firms is compared to the control firms in each of the years following the IPO. This list of metrics was chosen to examine four broad categories of performance. Comparisons of ROA and Net Profit Margin show differences in the profitability. Comparisons of the number of employees, research

and development expenditures, advertising expense and Capital Expenditures (CapEx) show whether the sample firms appear to be capital constrained due to the high leverage resulting from their LBOs. Comparing working capital will show whether there are differences in liquidity. Finally, the debt related metrics allow direct comparisons of the use of leverage.

Table 3: Accounting Metrics Used to Measure Performance
ROA
Net Profit Margin
Number of Employees/Sales
R&D Expenditures/Sales
Advertising Expense/Sales
CapEx/Sales
Working Capital/TA
Long Term Debt/Total Assets
Long-Term Debt/Market Cap

In addition to accounting-based metrics, the sample firms are compared to their control sample peers using market-based metrics. Borrowing from Levis (2011), buy and hold adjusted returns (BHAR) are computed for each sample firm/control sample pair as follows:

$$BHAR = \prod_{t=1}^{T}\left(1 + r_{i,t}\right) - \prod_{t=1}^{T}\left(1 + r_{Ci,t}\right)$$

where $r_{i,t}$ is the return to sample company i during period t and r_{Ci} is the return to the control company for sample firm i over the same period.

IV. Results

Table 4 shows the Buy and Hold Adjusted Returns (BHAR) for our sample of PE-backed firms compared to their non-PE-backed control firms during the 36 months following their IPO in the pre-recessionary period defined as March 2002 through December 2007.[3] We truncated our analysis at 36 months because at this point, the number of sample firms drops below 30 and tests of statistical significance become less meaningful.

As shown in Table 4, the performance of PE-backed firms did not significantly exceed that of their control firms in their first year of existence. The period from 9 to 17 months following the IPOs did show significant out-performance at either the 10 or 5 percent levels. However, the counts of the number of positive and negative observations shows similar proportions throughout the time period. For example, the average BHAR in the 13 months following the IPO was 14.28 percent, significant at the 5 percent level. However, that result included BHARs for 119 pairs of companies and the mix of positive and negative observations was 62 positive and 57 negatives, far from

[3] The National Bureau of Economic Research (NBER) reports that the business cycle peaked in the fourth quarter of December 2007 and bottomed in June 2009.

Table 4: Buy and Hold Adjusted Returns (BHAR) during the Non-Recessionary Period 2002 through 2007 for Sample of Post-IPO PE-Backed Firms Compared to Non-PE-back Control Companies by Month Relative to IPO Date

Month relative to IPO	Average BHAR	N	t-Statistic	Significance Level (One-Tail Test)	Number Positive	Number Negative	Binomial Probability[1]
1	0.50%	147	0.42	0.339	76	71	0.690
2	-0.22%	147	-0.12	0.452	67	80	0.161
3	0.13%	147	0.05	0.480	66	81	0.124
4	0.97%	147	0.36	0.359	69	78	0.255
5	0.29%	147	0.10	0.461	70	77	0.310
6	2.76%	147	0.80	0.213	71	76	0.371
7	2.36%	143	0.62	0.269	69	74	0.369
8	5.00%	139	1.13	0.131	69	70	0.500
9	9.19%	133	1.66	0.050	69	64	0.698
10	10.44%	130	1.65	0.051	66	64	0.604
11	12.70%	130	2.00	0.024	67	63	0.669
12	15.07%	128	1.91	0.029	67	61	0.732
13	14.28%	119	2.12	0.018	62	57	0.709
14	14.88%	118	1.89	0.031	57	61	0.391
15	16.76%	115	1.73	0.043	55	60	0.355
16	16.52%	110	1.94	0.027	55	55	0.538
17	15.70%	102	1.54	0.064	51	51	0.539
18	9.93%	99	1.23	0.112	46	53	0.273
19	1.88%	95	0.27	0.393	42	53	0.152
20	5.73%	93	0.73	0.234	40	53	0.107
21	3.09%	93	0.40	0.344	41	52	0.150
22	0.58%	89	0.08	0.469	41	48	0.263
23	-0.36%	83	-0.05	0.481	36	47	0.136
24	4.28%	79	0.49	0.311	36	43	0.250
25	4.27%	72	0.49	0.313	32	40	0.205
26	3.14%	66	0.36	0.361	31	35	0.356
27	1.09%	64	0.12	0.451	25	39	0.052
28	3.06%	64	0.32	0.373	25	39	0.052
29	5.13%	61	0.54	0.297	28	33	0.304
30	-5.03%	57	-0.55	0.292	22	35	0.056
31	-0.70%	52	-0.07	0.473	20	32	0.063
32	-6.33%	45	-0.55	0.292	17	28	0.068
33	-2.67%	42	-0.21	0.418	17	25	0.140
34	0.10%	42	0.01	0.497	17	25	0.140
35	6.36%	41	0.39	0.349	16	25	0.106
36	-1.72%	35	-0.09	0.465	13	22	0.088

[1]The binomial probability is the probability of at least the observed number of positive occurring randomly in a sample of N observations, assuming equal likelihood of positive and negative observations

Table 5: Buy and Hold Adjusted Returns (BHAR) during the Non-Recessionary Period 2002 through 2007 for Sample of Post-IPO PE-Backed Firms Compared to Non-PE-back Control Companies, by Calendar Month

Month	Cumulative Average BHAR	N	t-statistic	Monthly Average Difference	Number Positive	Number Negative	Binomial Probability[1]
Mar-02	21.409%	1		21.409%	1	0	
Apr-02	44.740%	2	10.01	19.217%	2	0	1.0000
May-02	53.803%	3	7.71	6.261%	2	1	0.8750
Jun-02	47.068%	5	4.70	-4.379%	2	3	0.5000
Jul-02	30.003%	5	2.27	-11.604%	2	3	0.5000
Aug-02	38.595%	7	4.65	6.609%	5	2	0.9375
Sep-02	49.439%	7	5.68	7.824%	4	3	0.7734
Oct-02	42.934%	7	4.88	-4.353%	3	4	0.5000
Nov-02	46.678%	9	5.47	2.619%	5	4	0.7461
Dec-02	43.691%	10	5.61	-2.036%	4	6	0.3770
Jan-03	54.776%	11	9.64	7.714%	8	3	0.9673
Feb-03	36.970%	11	7.49	-11.504%	3	8	0.1133
Mar-03	46.146%	12	16.34	6.699%	8	4	0.9270
Apr-03	50.436%	12	11.05	2.935%	7	5	0.8062
May-03	52.743%	12	9.15	1.534%	9	3	0.9807
Jun-03	59.156%	12	11.31	4.199%	7	5	0.8062
Jul-03	76.320%	12	20.27	10.784%	9	3	0.9807
Aug-03	80.485%	13	17.84	2.362%	6	7	0.5000
Sep-03	69.055%	15	7.39	-6.333%	7	8	0.5000
Oct-03	64.359%	17	16.98	-2.778%	8	9	0.5000
Nov-03	62.206%	18	26.20	-1.310%	7	11	0.2403
Dec-03	65.407%	21	24.80	1.974%	14	7	0.9608
Jan-04	58.592%	23	15.92	-4.120%	10	13	0.3388
Feb-04	61.027%	23	22.43	1.536%	12	11	0.6612
Mar-04	57.463%	27	27.00	-2.213%	10	17	0.1239
Apr-04	59.862%	29	32.29	1.523%	15	14	0.6445
May-04	53.087%	31	13.47	-4.238%	13	18	0.2366
Jun-04	47.991%	31	21.47	-3.329%	14	17	0.3601
Jul-04	52.416%	33	24.65	2.991%	20	13	0.9186
Aug-04	52.450%	42	21.04	0.022%	20	22	0.4388
Sep-04	53.274%	43	23.95	0.540%	24	19	0.8198
Oct-04	48.406%	44	14.57	-3.176%	23	21	0.6742
Nov-04	51.411%	46	19.68	2.025%	25	21	0.7693
Dec-04	52.080%	49	20.73	0.442%	26	23	0.7159
Jan-05	50.211%	53	37.63	-1.229%	28	25	0.7084
Feb-05	49.364%	59	30.95	-0.564%	32	27	0.7825
Mar-05	52.259%	63	33.21	1.938%	38	25	0.9615

Month	Cumulative Average BHAR	N	t-statistic	Monthly Average Difference	Number Positive	Number Negative	Binomial Probability[1]
Apr-05	54.054%	63	27.44	1.179%	39	24	0.9785
May-05	53.594%	66	23.16	-0.299%	32	34	0.4511
Jun-05	61.498%	69	40.70	5.146%	44	25	0.9923
Jul-05	67.468%	77	32.61	3.697%	51	26	0.9986
Aug-05	67.998%	81	43.31	0.316%	41	40	0.5878
Sep-05	67.414%	87	40.50	-0.348%	43	44	0.5000
Oct-05	69.512%	89	46.33	1.253%	48	41	0.8017
Nov-05	65.167%	90	33.67	-2.563%	39	51	0.1231
Dec-05	70.272%	95	46.97	3.091%	56	39	0.9679
Jan-06	70.344%	97	47.40	0.042%	45	52	0.2713
Feb-06	67.771%	99	42.18	-1.510%	55	44	0.8862
Mar-06	71.911%	106	42.83	2.467%	57	49	0.8089
Apr-06	75.305%	109	77.33	1.975%	60	49	0.8749
May-06	72.765%	112	58.81	-1.449%	45	67	0.0234
Jun-06	74.459%	112	48.41	0.980%	63	49	0.9220
Jul-06	76.759%	119	54.04	1.318%	58	61	0.4273
Aug-06	71.949%	122	44.74	-2.721%	55	67	0.1597
Sep-06	72.293%	124	74.84	0.200%	63	61	0.6061
Oct-06	71.684%	128	47.05	-0.353%	72	56	0.9337
Nov-06	71.297%	134	56.87	-0.226%	69	65	0.6670
Dec-06	72.840%	139	69.88	0.901%	78	61	0.9367
Jan-07	70.717%	147	58.08	-1.228%	72	74	0.4670
Feb-07	72.529%	147	77.34	1.061%	77	69	0.7718
Mar-07	74.179%	147	67.71	0.957%	81	65	0.9204
Apr-07	74.119%	147	76.84	-0.034%	73	73	0.5330
May-07	73.936%	147	62.30	-0.105%	70	77	0.3104
Jun-07	77.549%	147	81.11	2.077%	90	57	0.9976
Jul-07	75.703%	147	69.69	-1.040%	69	78	0.2548
Aug-07	69.105%	147	59.41	-3.755%	58	89	0.0065
Sep-07	69.014%	147	60.84	-0.053%	73	74	0.5000
Oct-07	66.875%	147	41.04	-1.276%	69	78	0.2548
Nov-07	66.923%	146	49.51	0.039%	73	73	0.5330
Dec-07	67.692%	146	51.67	0.461%	76	70	0.7187

[1]The binomial probability is the probability of at least the observed number of positive occurring randomly in a sample of N observations, assuming equal likelihood of positive and negative observations.

significant using a binomial test. Depending on one's preference for statistic, one might interpret the overall table as either weakly supportive of the argument that PE-backed IPOs out-perform their peers or that the performance of these firms is at least as good as, but not statistically better than their peers. This result is different than the findings of Holthausen and Larcker (1996) who

found that the PE-backed firms performance exceeded their broader control group. Our results are more consistent with Cao, J. and J Lerner, (2009) who found that their sample performed "as well or better." Perhaps the difference in results occurs because of differences in the sample period or the methodology. Our sample of PE-backed firms was matched to control firms with very similar characteristics and perhaps because of this close matching, the returns of the PE-backed group, while strong over most of the period, were not significantly better than the control firms.

While the results shown in Table 4, by month relative to each firm's IPO date, are useful in gauging the overall returns of post-IPO firms in aggregate, these returns could not be replicated by an investor because the returns are calculated in event time (i.e., relative to each firm's IPO date, not calendar time). It is, of course, impossible for an investor to simultaneously invest in an IPO occurring in, for example, March of 2002 and May of 2005. To measure the returns that could have been earned by an investor, with a caveat to be discussed later, we calculated the BHARs in calendar time. Table 5 shows the BHARs by calendar month from the date of the earliest IPO in our sample, March 2002, through the last month of the pre-recessionary period, December 2007.

At first glance, this table would appear to suggest that PE-backed firms in the pre-recessionary period outperform their non-PE backed peers by substantial amounts. The BHARs from the first month are large, positive and statistically significant. This result is consistent with the findings of Holthausen and Larcker (1996) who found that the PE-backed firms performance exceeded their broader control group. Before ending the story here, however, one must consider two additional pieces of information. First, as shown in Table 5, binomial tests of the individual differences support the opposite conclusion. In only two months, May 2006 and August of 2007, did the number of positive differences exceed the proportion that could be expected to randomly occur by an amount statistically significant at a level under 5 percent. Second, the large magnitudes occur largely because of a few very large positive returns early in the sample period. In the first two months of the period, two firms had large positive returns and the BHAR at the end of the second month, April 2002, was an impressive 44.7 percent. The BHARs peaked in June of 2007, six months prior to the official start of the recession, then dropping from 77.5 percent to 67.69 percent.

The combined results of the t-tests and binomial tests support the following conclusions: First, our findings are generally consistent with prior research, all of which used samples taken from periods of a mostly expanding economy. However, while the aggregate returns to PE-backed IPOs do seem to be at least as strong, and maybe somewhat better, than that of their non-PE backed peers during good economic conditions, many individual PE-backed IPOs underperformed their peers.[4] Second, while the performance of our sample of PE-backed firms performed as well or better than their non-PE-backed control firms in the expansionary period of the first half of the 2000s, the differences were quite different during the great recession. Table 6 shows the returns to the sample firms, compared to their control firms, for the 30-month period beginning in January 2008, the official start of the recession. During the recession, the PE-backed firms performed significantly worse than their non-PE-backed peers.

[4] A critically important caveat should be considered before an investor considers an investment strategy of buying PE-backed IPOs. The results show that the overall returns, while positive, result from a combination of very good and very bad investments with returns to the good deals more than offsetting the losses from the bad ones. If this result is true and generalizable to future periods (which we will see is very dependent on being able to accurately predict future market conditions), it is critical that an investor participate in *every* PE-backed IPO. The likelihood that any investor, let alone an individual investor, could participate in every IPO is remote. Since one might logically expect that inside investors would have better insights into which deals have significant long-run potential, market conditions could result in most investors missing the best deals and getting an oversize portion of the ones that will subsequently under-perform.

By the end of July 2008, the PE-backed firms had under-performed their peers by a statistically significant -7.43 percent (p=0.031). By the end of one year, at the end of December 2008, the under-performance had worsened to -14.86 percent (p=0.041). Over the 30-month period, the cumulative BHAR, or difference between the return on the PE-backed IPOs and that of their control firms, was -22.93 percent (p=0.043) worse than their non-PE-backed peers.[5] We also examined the number of positive and negative BHARs by month during the period. Except for the first month of the recessionary period, January 2008, the number of positive observations was well below their expected value and statistically significant using a binomial test. The results provide the first evidence that PE-backed firms significantly under-perform their non-PE-backed peers during downturns in the economy.

To explain why the differential performance turned so negative once the economy moved toward recession, we examined the financial characteristics of the firms using the accounting metrics discussed earlier. Table 7 shows the differences in the accounting metrics between the sample and control firms in the pre-recession and recession period. Consistent with the differences in market performance during the pre-recessionary period, the PE-backed firms exhibit significantly higher levels of Return-on-Assets and Profit Margin during the earlier period. Once the economy turned downward, the differences in ROA and Profit Margin declined and are not statistically different in the recessionary period.

The other most notable (and predictable) result highlighted in Table 6 is the difference in leverage between the PE-backed sample and the non-PE-backed control companies. As Appelbaum (2014) notes, it is typical for PE groups to add substantial leverage to the firms they control and to use this leverage to extract significant cash dividends from the company. In our sample, the average difference in long-term debt-to-total assets ratio was nearly 11 percent higher pre-recession and 14.1 percent higher during the recession for the PE-backed firms compared to their controls. Differences in long-term debt-to-market capitalization ratios also increased during the recessionary period, from a 9.3 percent (t=2.10) to 62.4 percent (t=5.07).[6] While firms with high leverage may do well in strong economic conditions, high leverage makes it more difficult for companies to perform well in (and in many cases even survive) economic downturns. Since the so-called "great recession" was so pronounced, the results we show in this study may be uncharacteristically dramatic.

Table 7 also shows that the PE-backed firms came to market with fewer employees and less working capital than equivalent non-PE-backed firms. This is also expected as PE firms are well-known for streamlining their firms to make them as profitable as possible and this attractive

[5] When considering the six month period before the official start of the recession, during which the PE-backed firms began to show weakness, a 36-month BHAR was -35.78 percent, (p=0001).

[6] When including the 6 six-month period leading up to the official start of the recession, the pre-recession difference in Market Debt Ratios was 4.2 percent, and not significantly different than zero.

Table 6: Buy and Hold Adjusted Returns (BHAR) during the Recessionary Period January 2008 through June 2010 for Sample of Post-IPO PE-Backed Firms Compared to Non-PE-back Control Companies

Month	Average BHAR	N	t-statistic	Significance Level (One-Tail Test)	Number Positive	Number Negative	Binomial Probability[1]
Jan-08	-2.025%	146	-1.431	0.0773	71	75	0.4020
Feb-08	-2.494%	146	-1.325	0.0936	64	82	0.0796
Mar-08	-4.027%	145	-1.604	0.0555	60	85	0.0229
Apr-08	-3.993%	144	-1.415	0.0796	58	86	0.0121
May-08	-2.080%	143	-0.605	0.2731	63	80	0.0904
Jun-08	-2.876%	142	-0.738	0.2309	58	84	0.0178
Jul-08	-7.432%	141	-1.877	0.0313	52	89	0.0012
Aug-08	-5.206%	140	-1.132	0.1299	57	83	0.0171
Sep-08	-8.541%	140	-1.693	0.0464	42	98	0.0000
Oct-08	-8.290%	138	-1.328	0.0932	41	97	0.0000
Nov-08	-12.336%	132	-1.676	0.0481	36	96	0.0000
Dec-08	-14.856%	130	-1.749	0.0413	34	96	0.0000
Jan-09	-12.133%	129	-1.229	0.1106	34	95	0.0000
Feb-09	-12.340%	129	-1.045	0.1490	32	97	0.0000
Mar-09	-18.559%	127	-1.824	0.0352	36	91	0.0000
Apr-09	-29.019%	126	-2.888	0.0023	29	97	0.0000
May-09	-32.121%	125	-3.982	0.0001	25	100	0.0000
Jun-09	-21.242%	125	-2.366	0.0098	32	93	0.0000
Jul-09	-18.315%	123	-1.670	0.0488	31	92	0.0000
Aug-09	-25.441%	122	-3.121	0.0011	33	89	0.0000
Sep-09	-24.202%	120	-2.455	0.0078	28	92	0.0000
Oct-09	-22.870%	117	-2.031	0.0223	29	88	0.0000
Nov-09	-24.102%	117	-2.318	0.0111	33	84	0.0000
Dec-09	-27.056%	115	-2.655	0.0045	27	88	0.0000
Jan-10	-27.507%	114	-2.585	0.0055	29	85	0.0000
Feb-10	-27.472%	114	-2.595	0.0054	27	87	0.0000
Mar-10	-24.704%	114	-2.045	0.0216	26	88	0.0000
Apr-10	-24.574%	112	-2.321	0.0111	27	85	0.0000
May-10	-23.716%	108	-2.084	0.0197	25	83	0.0000
Jun-10	-22.293%	108	-1.729	0.0433	27	81	0.0000

[1]The binomial probability is the probability of at least the observed number of positive occurring randomly in a sample of N observations, assuming equal likelihood of positive and negative observations.

Table 7: Differences in Financial Variable between PE-backed Sample Firms and non-PE-backed Control Firms Before and During the Recession

Financial Variable	Definition	Mean Difference (Sample – Control) Before Recession	Mean Difference (Sample – Control) During Recession
Return on Assets	Net Income / Total Assets	0.0195 t = (1.98)***	-0.0100 t = (-0.59)
Profit Margin	Net Income / Revenue	0.2091 t = (2.73)***	0.1541 t = (1.04)
Employees	Number of Employees / Revenue	-0.0017 t = (-4.74)***	-0.0011 t = (-4.84)***
Research and Development	Research & Development Expense / Revenue	-0.0003 t = (-0.77)	-0.0002 t = (-1.44)*
Working Capital	Working Capital[1] / Total Assets	-0.0489 t = (-4.06)***	-0.0097 t = (-0.69)
Advertising Expense	Advertising Expense / Revenue	-0.0025 t = (-0.59)	-0.0091 t = (-0.54)
Capital Expenditures	Capital Expenditures / Revenue	-0.2723 t = (-1.32)*	-0.1314 t = (-0.49)
Book Debt Ratio	Long Term Debt[2] / Total Assets	0.1092 t = (7.52)***	0.1408 t = (7.72)***
Market Debt Ratio	Long-Term Debt / Market Capitalization[3]	0.0927 t = (2.10)**	0.6237 t = (5.07)***

1. Working Capital = Current Assets less Current Liabilities not including Current Portion of Long-term Debt
2. Long-Term Debt includes Capital Leases and the Current Portion of Long-Term Debt and Capital Leases
3. Market Capitalization = Long Term Debt + Market Value of Equity

IPO candidates. In our sample, the number of employees, standardized by sales, was statistically significantly less in the recessionary period. Working capital-to-total assets was less in the pre-recessionary period but not during the recession indicating either that the PE-backed firms were able to shore up their working capital or that both groups of firms had low working capital during the recession. We found no statistically significant differences in expenditures for research and development, advertising, or capital expenditures between the two groups.

V. Summary and Extensions

In this study, we examine the performance of PE-backed firms following their IPOs during the expansionary period of the early 2000s and these same firm's performance later in the decade during the "great recession." Unlike studies that compare performance to groups of somewhat similar firms with the same two-digit SIC codes, we have created a matched control group based on the more detailed multi-digit NAICS codes.

The results during the market expansion of the early decade generally parallel those of the existing literature which finds that PE-backed IPOs perform at least as well and perhaps better than their non-PE-backed peers. While prior studies conclude that IPOs are a positive addition to the market and its investors, we go further and compare performance during the great recession. Here we find very different results, with PE-backed firms performing poorly compared to their non-PE-backed peers.

During recessionary periods, our sample of PE-backed firms compare dramatically worse than their peers. The reason for this poor performance can be seen on the balance sheets of the new IPO firms, which, on average, carry more debt than their non-PE-backed peers. The leveraging process is fundamental to the role of private equity groups. In the typical deal, the PE firm takes control of a fledgling firm or purchases an established public or private firm.

In return for their management guidance and the promise of large financial gains to the founders and management of the acquired firms, the PE groups often extract significant cash from the business by raising debt to fund large dividend payouts, and management fees. After some time under the new management structure, the PE firm uses their expertise to bring the firm to the public market through an IPO. This IPO provides significant gains to the firm's existing investors but leaves the new firm heavily levered. While these newly public firms may do well if the economy stays strong, their high leverage makes them extremely vulnerable during economic downturns.

There are many opportunities for further study of PE-backed firms. Our results show that the success of PE-backed firms, post IPO, is particularly dependent on the state of the economy. During the great recession of the late 2000s, these firms performed much worse than very similar firms not backed by PE groups. How will these firms perform during less severe recessions?

References

Appelbaum, Eileen and Rosemary Batt, (2014), Private Equity at Work: When Wall Street Manages Main Street, New York: Russell Sage Foundation.

Cao, J. and J Lerner, (2009), "The Performance of Reverse Leveraged Buyouts," *Journal of Financial Economics,* Vol. 91, pp. 139-157.

Campbell, John Y., Jens Hilscher, and Jan Szilagyi, (2010), "Predicting Financial Distress and the Performance of Distressed Stocks", Working Paper, Harvard University.

Fama, Eugene, and Kenneth French, (1993), "Common Risk Factors in the Returns of Stocks and Bonds," *Journal of Financial Economics*, Vol. 33, pp. 3-55.

Gospel, Howard, Andrew Pendelton, and Sigurt Vitols, (2013), Financialization, New Investment Funds, and Labour – An International Comparison, Oxford: Oxford University Press.

Holthausen, Robert W., and David Larcker, (1996), "The Financial Performance of Reverse Leveraged Buyouts," *Journal of Financial Economics*, Vol. 42, pp. 293-332.

Dalseth, Haakon, and Jonatan Larsen, (2018), "The Effect of Post-IPO Private Equity Ownership An empirical study of how post-IPO private equity ownership affects the stock market- and accounting performance of private equity-backed IPOs in the US," working paper, Norwegian School of Economics

Levis, Mario, (2011), "The Performance of Private Equity-Backed IPOs," *Financial Management*, Spring, pp. 253-277.

Prassl, Jeremias, (2015), "The Employment Impact of Private Equity Investors: A Return of the

Barbarians?" *Industrial Law Journal*, Vol. 44, March, pp. 150-157.

Appendix: Data Date and Company Name

20051231	A R C Document Solutions (Then American Reprographics Co.)
20051231	Accuride Corp.
20061231	AerCap Holdings NV
20030131	Aeropostale (now ARO LIQUIDATION INC)
20061231	Aircastle Ltd.
20061231	Allegiant Travel Co.
20061231	Allied World Assurance Co. Holdings Ltd.
20061231	Alphatec Holdings, Inc.
20061231	Altra Industrial Motion (Then Altra Holdings)
20051231	Amerisafe, Inc.
20031231	AMIS Holdings, Inc.
20021231	Asbury Automotive Group, Inc.
20041231	Asset Acceptance Capital Corp
20041231	Auxilium Pharmaceuticals, Inc.
20031231	AXIS Capital Holdings Ltd.
20061231	Bare Escentuals, Inc.
20040930	Beacon Roofing Supply Inc
20021231	Big 5 Sporting Goods Corp.
20041231	Blackbaud Inc
20051231	Brookdale Senior Living, Inc.
20061231	Buckeye GP Holdings LP
20041231	Bucyrus International Inc
20031231	Buffalo Wild Wings, Inc.
20051231	Builders FirstSource, Inc.
20041231	C B R E Group (Then CB Richard Ellis Group, Inc.)
20031231	CapitalSource, Inc.
20061231	Carrols Restaurant Group (Carrols Holding Corp.)
20031231	Carter's, Inc.
20051231	CBeyond Communications, Inc.
20051231	Celanese Corp.
20011231	Chart Industries, Inc.
20041231	Cherokee International Corp.
20031231	Citadel Broadcasting Corp.
20060131	Citi Trends, Inc.
20061231	Clayton Holdings, Inc.
20041231	Commercial Vehicle Group, Inc.
20070331	CommVault Systems, Inc.
20061231	Complete Production Services, Inc.
20051231	Consolidated Communications Holdings, Inc.
20041231	Copano Energy LLC
20021130	Corel Corp.
20050630	D F C Global (Then Dollar Financial Corp.)

20061231 Dayton Superior Corp.
20051231 DealerTrack Holdings, Inc.
20041231 Design Within Reach, Inc.
20041231 Domino's Pizza, Inc.
20051231 Dover Saddlery, Inc.
20051231 Dresser-Rand Group, Inc.
20011231 E X C O Resources, Inc.
20051231 Eagle Bulk Shipping, Inc.
20061231 Eagle Rock Energy Partners LP
20060930 Eagle Test Systems, Inc.
20061231 Eastern Insurance Holdings, Inc.
20061231 eHealth, Inc.
20051231 Emergency Medical Services Corp.
20031231 Endurance Specialty Holdings Ltd.
20050331 EnerSys, Inc.
20041231 Entorian Technologies, Inc. (Then Staktek Holdings)
20051231 ev3, Inc.
20051231 Everi Holdings (Then Global Cash Access Holdings)
20061231 First Mercury Financial Corp.
20041231 Foundation Coal Holdings, Inc. (now Alpha Natural Resources)
20051231 Freightcare of America (Then FCA Acquisition Corp)
20051231 G F I Group, Inc.
20061231 GateHouse Media, Inc.
20061231 GeoMet, Inc.
20061231 Globalstar, Inc.
20061231 Golfsmith International Holdings, Inc.
20041231 Greenfield Online Inc
20061231 H & E Equipment Services, Inc.
20061231 HealthSpring, Inc.
20011231 Herbalife Ltd. (filed S-1 as WH Holdings. Now Herbalife Nutrition)
20051231 Hercules Offshore, Inc.
20051231 Hittite Microwave Corp.
20051231 Horizon Lines, Inc.
20061231 Houston Wire & Cable Co.
20051231 Huntsman Corp.
20061231 I C F International, Inc.
20061231 Innophos Holdings, Inc.
20041231 Intersections, Inc.
20041231 Iowa Telecommunications Services, Inc.
20021231 JetBlue Airways Corp
20051231 Kenexa Corp
20030131 Kirkland's, Inc.
20061231 Koppers Holdings, Inc.
20031231 L E C G Corp
20061231 LeMaitre Vascular, Inc.
20051231 Lincoln Educational Services Corp.
20050930 M W I Veterinary Supply, Inc.
20051231 Maidenform Brands, Inc.

20041231 Market Leader (Then HouseValues, Inc.)
20041231 McCormick & Schmick's Seafood Restaurants, Inc.
20060331 Micrus Corp.
20021231 Montpelier Res Holdings Ltd.
20011231 Morton's Restaurant Group, Inc.
20041231 Nalco Holding Co.
20031231 National Financial Partners Corp.
20041231 NeuroMetrix, Inc.
20051231 NeuStar, Inc.
20061231 NewStar Financial, Inc. (Now First Eagle Private Credit, LLC)
20061231 NightHawk Radiology Holdings, Inc.
20061231 NTELOS Holdings Corp.
20061231 Obagi Medical Products, Inc.
20051231 optionsXpress Holdings, Inc.
20061231 P G T Innovations (then P G T, Inc.)
20061231 Physicians Formula Holdings, Inc.
20041231 PlanetOut, Inc.
20050331 Prestige Consumer Healthcare (Then Prestige Brands Holdings)
20041231 ProCentury Corp.
20031231 Quality Distribution, Inc.
20051231 Quintana Maritime Ltd.
20060331 R B C Bearings, Inc.
20050131 R T W Retailwinds (then New York & Co.)
20021231 Red Robin Gourmet Burgers, Inc.
20051231 Reddy Ice Holdings, Inc.
20021231 Regal Entertainment Group
20061231 Regency Energy Partners LP
20051231 Rockwood Holdings, Inc.
20051231 Ruths Hospitality (then Ruth's Chris Steak House, Inc.)
20021231 S I International - now Serco Services
20051231 SeaBright Insurance Holdings, Inc. (Now SeaBright Holdings, Inc.)
20030630 Seagate Technology LLC
20061130 Sealy Corp.
20051231 Silicon Graphics International Corp. (was Rackable Systems)
20060831 SMART Modular Technologies (WWH), Inc.
20061231 Spirit AeroSystems Holdings, Inc.
20061231 Susser Holdings Corp.
20041231 Symmetry Medical, Inc.
20051231 SYNIVERSE Holdings, Inc.
20041231 T N S, Inc.
20041231 T R W Automotive Holdings Corp. (ZF TRW Automotive Holdings)
20051231 Taleo Corp.
20031231 Temper Sealy (was Tempur-Pedic International)
20061231 Town Sports International Holdings, Inc.
20060930 TransDigm Group, Inc.
20061231 U S BioEnergy Corp.
20041231 Ultra Clean Holdings, Inc.
20051231 Union Drilling, Inc.

20040930	Universal Technical Institute, Inc.
20061231	VeraSun Energy Corp.
20051031	Verifone Systwems (then VeriFone Holdings)
20051231	W & T Offshore, Inc.
20061231	Warner Chilcott Ltd.
20041231	WellCare Health Plans, Inc.
20051231	Xerium Technologies, Inc.
20060131	Zumiez, Inc.
20021231	ZymoGenetics, Inc.